RAILROAD GAZETTE

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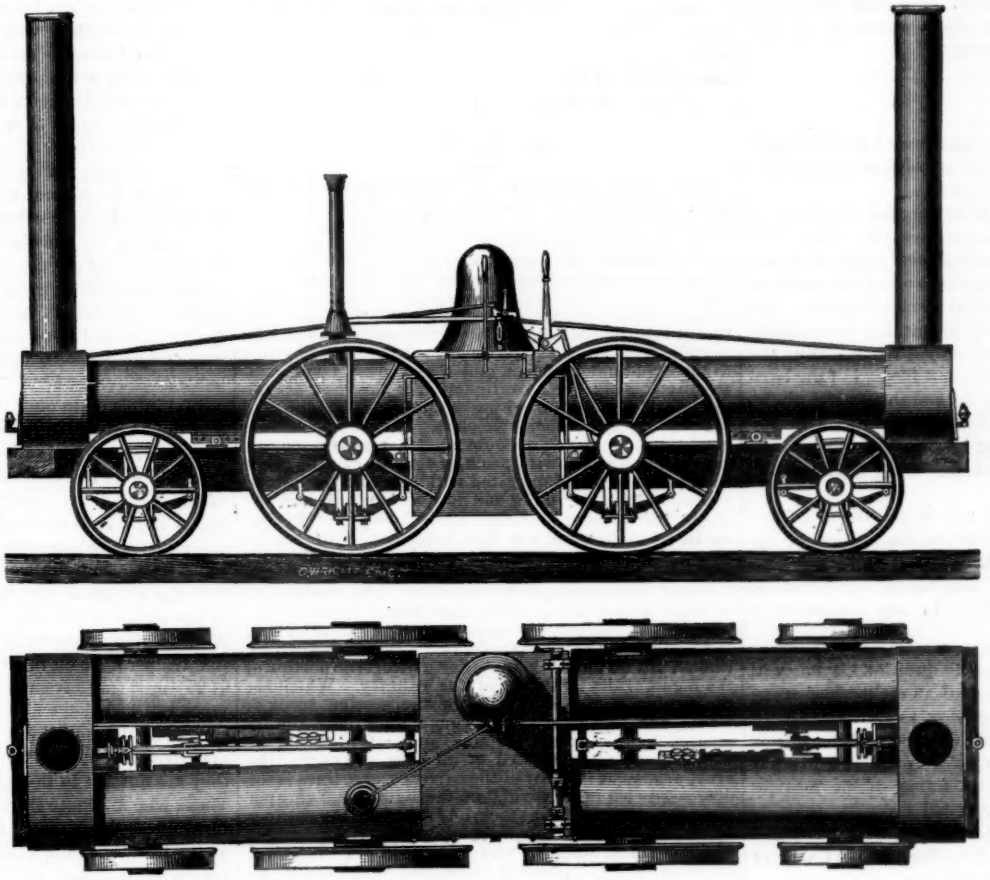
A BIT OF HISTORY.

The engraving which we give herewith, is a copy of a lithograph which forms part of the evidence given in 1853 in the celebrated "Winans eight-wheeled car trial." This was a suit brought by Ross Winans against the Eastern Railroad Company to recover for infringement of his patent on double "bogie" eight-wheeled cars. The suit was appealed from one court to another and finally decided against the plaintiff in the Supreme Court of the United States. The engine which we have illustrated was referred to to show that substantially the same principle was embodied in it that was claimed by Mr. Winans in his patent. It will be seen that it was, in fact, a double "bogie" locomotive. And the evidence shows that it was designed by Horatio Allen in 1830, and built in New York for the South Carolina Railroad Company in 1831. It is a curious relic and another illustration of the old saying, that extremes meet. Here we have a locomotive designed when steam locomotion was in its infancy, and yet embodying many of the features of the "Fairlie" locomotive, which is now claimed to be the latest and greatest triumph of engineering in this field. It has distinctly the double "bogie," the double boiler, and the draught from the truck. One curious feature is the *double-barrelled* boiler, as shown in the plan; *i. e.*, there were *two* barrels attached to each end of the fire-box. There was, however, but one cylinder to each truck or "bogie," and that—the cylinder—was attached to the smoke-box. The connections with the crank shafts were made with "ball joints." This engine was used before the effect of turning the exhaust steam up the chimney was discovered, which accounts for its tall smoke stacks. Their chief difficulty was in generating steam. Mr. Allen has informed us that much trouble was caused by the "light- wood" which was used for fuel, which soon clogged up the flues with resinous matter to such an extent as to prevent the generation of steam, the draft not being sufficiently strong to keep them clean.



Double Bogie Locomotive built in 1831 for the South Carolina Railroad; designed by Horatio Allen, C. E.

The following extract is copied from a report made by Mr. Allen "to the President and Directors of the South Carolina Canal and Railroad Company." It is dated Charleston, May 16, 1831:

* * * * * * * *

"As on every road there exists *a limit of weight* to be placed on each pair of wheels, and as on wooden roads this limit is much less than on an iron one, it becomes a still more interesting inquiry to ascertain by what means we may increase the quantity of power without exceeding the limit. On the Liverpool & Manchester road they appear practically to be limited to three tons on each pair of wheels, though some accounts state this to be too high, with their velocity, for the permanent benefit of the road. On a wooden road, where one-half inch iron is made use of, I would put the limit at one and a half tons per pair of wheels.

"If, therefore, there can be no arrangements whereby this disadvantageous relation may be provided for, it is evident, that to convey the same quantity of goods or transport the same number of passengers, we must incur twice the expense of attendance, twice the amount of repair, and twice the liability to accident. In fact, more than twice, since in doubling the weight of the engine we are able to appropriate a greater proportion of the increased weight to steam generating purposes.

"The arrangement (?) which I would propose to effect so desirable an object would be, as the limit exists in the quantity on each point of support, to increase the number of supports, *and thus distribute the weight over a greater surface.* I would therefore place the engine on six or eight wheels, and limit the weight to one and a half tons to each pair.

"There arise two objections to this arrangement, from the inequalities on the line of support: the one vertical and the other horizontal.

"If three or more wheels were united on a side to the same rigid straight line, and the road had irregularities in its surface, then would arise great and injurious strains to the structure, from the wheels not being able to adapt themselves to the irregularities.

"This difficulty may be completely obviated by giving the weight to be supported but two points of support on each side, and making these points the centers of motion of the pairs of wheels.

"This arrangement will evidently adapt itself with as much ease and simplicity to all vertical irregularities, as is the case with two wagons connected together.

"As to the change of direction horizontally, as in the entrance of turn-outs and the passage of curves, a very simple adjustment will relieve the arrangement from all difficulty. If we connect the frame with the cross piece only at the center, and by a horizontal point, the two sets of wheels will thereby be enabled to pass all curvatures with the facility of two simple wagons connected in the ordinary manner.

"No attempt has yet been made to accommodate the locomotive carriage to the passage of curvatures, by providing the means of changing the parallelism of the axles, and giving them the relative inclination that the radius of curvature requires.

"I consider it as a point well worthy of examination, and not presenting serious difficuties. I fully believe that on the Baltimore & Ohio road experience will *compel* them to have recourse to it. It is one of the points on which essential improvement may be expected. If successfully introduced, it will much reduce, if not remove, the strain acting laterally on the wheels, in passing round curves. The leverage with which this strain acts is much increased as the diameter of the wheel is increased; and so important it is (?) to have large wheels for locomotive purposes, that some arrangement, providing especially for this strain, must be made. The simplest mode which suggests itself is to extend the axle and introduce braces between its extremity and the under side of the *felloe.* By this arrangement any required degree of strength may be attained.

"I am fully impressed with the belief that locomotive wheels will, ere long, be introduced, of much greater diameter than any heretofore used. In England they have increased gradually from 2½ to 5½ feet, and they have not as yet reached their limit.

"If it be asked why, with the views herein expressed, I do not recommend the immediate introduction of some of the arrangements, I would reply, that no improvements, however much they may promise, can be effected without considerable expense and frequent disappointment, all of which may, with a little patience, be increased and borne by others. The age, especially as regards this subject, makes its improvement *by the month*, and few can possibly pass by without contributing some important facts connected with it. And so fortunate do I consider the situation of the present undertaking, that I fully believe, while it frequently gathers the experience of others, it will, nevertheless, take the lead in transportation by the hundred miles with the speed and economy of railroads.

"The first one hundred miles in railroads ever traveled in continuation by steam, will take place in South Carolina, the proud day of which performance is not far distant. Most respectfully.

"HORATIO ALLEN, Chief Engineer."

Any one who has read the arguments from the other side of the water in favor of double "bogie" locomotives must be struck with the similarity of the reasoning to that of Mr. Allen, written forty years ago! Charles Reade in one of his late novels has said "that the wrong time is as bad as the wrong thing." Judging from the reported success of the "Fairlie Engine" in Europe, Mr. Allen erred only in anticipating the requirements of engineering science by a matter of two score years.

The following extracts are made from a copy of the printed testimony given by Mr. Allen, in 1853, in the trial before referred to.

* * * * * * * *

Q. Will you state when your plans for the improvement of the steam carriage were matured in your mind, as to the principles of construction and operation?

A. I should think during the last months of 1830.

Q. Whether were your plans carried into effect, and when was it?

A. They were carried into effect in the year 1831.

Q. What were those plans? Whether or not were they drawn by any engineer? If so, by whom, and when?

A. Those plans were the plans of an eight-wheeled engine. I gave each four wheels, at either end of the engine, an independent frame or truck. I connected the center of that frame or truck with the boiler of the locomotive, by a center pin, and I supported each end of the boiler by rollers resting on the sides of the truck, about midway between the pair of wheels, commonly called side bearings. This arrangement allowed each truck or frame to move horizontally around a pin, and allowed each frame to move vertically around the point at which the boiler rested around that frame or truck.

* * * * * * *

Q. When, where and by whom was the first railway steam engine made according to your plan and drawings? When was it first put into operation, and where?

A. In the year 1831, in the city of New York, West Point Foundry Co., in the early part of the year 1832, at Charleston, in South Carolina; the work was begun in June or July, 1831.

Q. Whether or not were other, and how many, engines subsequently built and put in operation on said road, constructed in said manner?

A. Yes. Three others.

Q. When?

A. In the year following.

Q. Will you explain how the running part of these engines operated, and what, if any, advantages they had over the ordinary running parts?

A. Perfectly well. Can't make that comparison. There were no ordinary running parts to compare with them. The eight-wheeled arrangement required a special adaptation for curvatures and vertical inequalities of line, not called for in the four-wheeled engine. The arrangements then introduced by me for these objects provided that adaptation perfectly. By providing the means which allowed each truck at the end of the locomotive to move horizontally around the central pin by which the truck was permanently connected with the locomotive, and by providing a support of the locomotive by side bearings about half way between the wheels.

Q. What effect, if any, had this arrangement of the running part upon the evenness and smoothness of the passage of the carriage while in operation?

A. It gave great ease and smoothness of operation, far beyond what was attainable in any four-wheeled car.

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Q. You have said in answer to question eleven, you say those plans were the plans of an eight-wheeled engine; will you be good enough now to state the length of that engine, the height of the wheels, if the wheels were of the same diameter, or, if they differed, in what way, and upon what part of the frame—if the locomotive had a frame—the engine rested?

A. I don't recollect; four of the wheels were five feet, and four, I think, were three feet; the cylinder of the engine was attached to the boilers.

Q. Can you recollect the length of the boilers, and whether, including the cylinder and the fire-boxes, the platform was covered by said boilers and cylinder, and fire-box, or otherwise? Please state all the facts.

A. I do not recollect the length of the boiler; the frames or trucks was (?) covered by the boilers; by frame I mean the truck; there was no independent frame; the boilers constituted the frame.

Q. Will you state in what manner the locomotive was drawn, whether from the end of each truck, or from the end of the boiler?

A. From the end of the truck.

Q. The preceeding question was intended to relate to the manner in which the locomotive in question was connected with a freight or passenger car, and in what way the freight or passenger car was connected with the locomotive, by the truck of the locomotive or otherwise.

A. Connected with the truck.

* * * * * * * *

Q. In answer to direct question thirteen, you have answered that a model which is marked "Horatio Allen, Defendant's Exhibit," is, in all respects, a true model of the South Carolina engine; will you be good enough to state upon what rule, a foot, the model is constructed?

A. It is a true model in reference to all the parts that it is a model of; the model referred to is two inches to the foot.

Q. Will you now measure the distance from the end of the frame of one of the trucks of said model, to the periphery of the rear wheel thereof, and state the distance thereto in feet?

A. About fifteen inches.

Q. Will you measure the distance from the same end of the frame to periphery of the forward wheel?

A. About five feet three inches.

Q. What is the diameter of the forward wheel?

A. Five feet.

Q. Will you now state the distance from the end of said truck to the extreme outside tread of the forward wheel?

A. About ten feet three inches.

Q. Are both the trucks made in the same proportion as the one you have measured?

A. Yes.

Q. From the tread of the forward wheel of the truck first measured, to the tread of the nearest wheel on the second truck, what is the distance in feet?

A. About fifteen inches.

Q. Will you now measure the whole length of the model referred to, and state what was the length of the locomotive?

A. Nearly twenty-two feet; about twenty one feet nine inches.

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Q. Will you explain whether the connecting rod on the drawing, was or was not attached to the crank on the main axle, with ball joints, or other equivalent, to allow the trucks to swivel and conform to the curves of the road, and did or did not such connection allow the trucks freely to conform to the curves of the road?

A. They were so made and did so allow.

Narrow-Gauge Railroads.

The extraordinary fervor with which many engineers and projectors of new lines of railway favor a reduction in the width of gauge is certainly very remarkable. All the arguments, mechanical and financial, with which we, with others, have combatted the use of the 6 feet gauge in this country, are now brought in use to show that the 4 ft. 8½ in. gauge is wasteful and extravagant, both in construction and operation; and the new lights in railway engineering are now engaged in showing that the true gauge should be anywhere from two feet to three and one half feet, and those who favor uniformity of gauge, or a continuation of the present ruling one of 4 ft. 8½ in. are looked upon as belonging to the old fogy or conservative class. Now, under certain conditions, we have no doubt that extremely narrow gauges can be used with profit, as they can be built with less money and operated with less cost per mile of operation than the ruling one now is; but these narrow-gauge lines must of necessity be isolated, and having no direct connection, for the interchange of traffic, with the general system, they must be operated under great disadvantages. As mere feeders to main lines, bringing sparsely populated sections into connection with the great lines of traffic, they will resemble lines of stages and baggage wagons, more than railway lines; and while their value as feeders must be acknowledged, it must not be forgotten that they will form no portion of the regular railway system of the country. Whenever the business and population of the section through which one of these narrow-gauge lines may run increases to any extent, the line must of necessity be widened and reconstructed at an increased cost. The great argument in favor of the narrow-gauge lines is the decreased cost of construction, the lighter and cheaper character of the rolling stock, and therefore the cheaper cost of operation. This may apply to certain sections of the country, but men who have been practically engaged in railway operation in the eastern, northern and western sections of the country, well know the disadvantages of attempting to run with light rolling stock in the winter months. Every attempt to run with light locomotives in snow storms has proved a failure, and so even light passenger trains are now seldom run with engines of less than twenty-two tons weight, and more often with those weighing twenty-eight tons. Engines weighing eight, ten or twelve tons each, are practically useless at certain seasons of the year, and we take it that no company can afford to keep two sets of equipment, one for the winter and another for summer. Practical railway men will understand this matter, even if the narrow-gauge theorists do not. What we are now saying is a mere word or two of caution, but of the comparative cost of construction, carrying capacity and general efficiency of the medium of 4 feet 8½ inch gauge, and the extremely narrow gauges, we intend to consider more at length hereafter.—*American Railway Times.*

Cheap Boiler Plates.

A correspondent of the New York *Tribune* contributes the following as an explanation of the frequency of "unaccountable" boiler explosions: "An Eastern manufacturer received a letter last week from a boiler-plate maker, in which the proposition was coolly made to furnish him 'C 1' iron, the poorest grade made, like the sample I send you, *and mark it with any brand* that he desired, so that he could make a boiler that would successfully compete with the best makers *in price.* That is, send a rotten stick of timber for a bridge, for instance, over which thousands of people pass, paint it over to cover defects, and brand it A 1—perfectly good."

Contributions.

ACTION OF COLD ON IRON AMD STEEL USED FOR RAILROAD PURPOSES.

Disturbance of Permanent Way by Frost.

BY WM. S. HUNTINGTON.

There seems to be a difference of opinion among scientific engineers in regard to the effect of low temperatures on iron and steel. It is the *general* impression that severe cold greatly reduces the strength of these metals, and this belief is founded on the fact that breakages of wheels, rails, axles, etc., occurs more frequently in winter than in summer, in cold regions. There are those, however, who attribute this excessive breakage to other causes, and, to a certain extent, their reasoning seems to be correct, especially as regards railroad appliances. This is a matter in which every railroad man is interested, and as this is the season of frost, it will afford opportunities for observation and experiment by which valuable information may be gained on the subject. Railroad men are the most extensive users of iron and steel, and such of this material as is used for railroad purposes is more exposed to the action of frost than when put to any other use; therefore, it would seem reasonable that they, above all others, should be at some pains to ascertain to what extent these metals are injured by frost, and to discover a remedy therefor. It is believed by some engineers that by a certain process of manufacture iron would be rendered proof against the action of frost. However this may be, it affords a wide field for experiment which would, no doubt, be attended with profitable results. At all events, if the prevailing opinion on the subject is correct, the damage account chargeable to frost on our Northern roads is enormous, and fame and fortune await the discoverer of an effective means of preventing the damaging effect of cold on iron and steel. As the climate is unfavorable for experimenting in this direction in a large portion of the country, and in all parts except in midwinter, it would seem that Captain Hall's projected Arctic expedition would afford an excellent opportunity for conducting a series of experiments on the subject in question. I would suggest to the Captain that if he were to provide suitable apparatus for the purpose, he might possibly make some valuable discoveries, even though he should not be successful in his main object. It is not likely, however, that the "Universal Yankee" will ever push a railroad into the regions he is about to explore, or that iron or steel will ever be required to withstand the temperature of the North Pole, to any great extent; but his experiments might be conducted aboard ship under temperatures corresponding with those in the different lattitudes traversed by railroads. In the New England States and the Canadas the mercury frequently reaches 40° below zero, but does not remain long enough at that point to give opportunity for ascertaining the effect of that temperature on the metals. It, however, remains at 25° or 30° for days at a time, and it is hard to convince railroad men who have had several years' experience in those regions that "breakdowns" are not more frequent at such times than at any other, and that they are not due to the action of frost on the metals. Those who attribute them to other causes (as above mentioned) argue that it is not the cold acting *directly* on the iron that causes the mischief, but that it is by reason of its disturbance of the road bed, causing great unevenness and also destroying its elasticity. An uneven track frozen solid is the real cause of much breakage, but there are few who will agree with those who maintain that low temperatures do not positively injure the strength of metals. Cold chisels, hammers, wrenches, and other tools that have withstood severe usage in mild weather, snap like glass on cold, frosty days. It is the common practice with mechanics who have a job to do out-of-doors, in cold weather, to warm their tools before going out, not merely for comfort, but to prevent breaking from the effect of the frost. It is stated, by some scientific men, that steel is less affected by cold than iron. Practical men will doubt this very much. Indeed, there is abundance of proof in the every-day practice of mechanics, in cold weather, that iron is far superior to steel in this respect. Steel hammers are frequently split entirely through by blows that would not affect an iron steel-faced hammer in the least, unless, perhaps, to crack the face. Steel hammers, of course, frequently break on account of flaws and bad temper, defects to which they are more liable than iron; but a perfectly sound, well-tempered steel hammer or sledge, when highly charged with frost, will not stand as heavy blows as will those made of a good quality of iron and steel-faced. Tracklayers and quarrymen frequently break steel crow-bars in cold weather, while iron bars are not in the least affected by the same usage, although

of the same size. Solid steel tools are considered by mechanics to be more liable to break in cold weather than iron tools faced up with steel.

Complaint has been made that steel rails were fully as liable to break in frosty weather as iron, and some have expressed the opinion that they were inferior to iron in this respect. These conclusions, however, are only "jumped at," as is the one that steel-headed rails are superior to any other to withstand the action of frost. It is the opinion of many that the poorer the quality of the iron, the more its strength is impaired by severe cold; but it would require a series of experiments, carefully conducted, to arrive at the facts in the case. It is possible that the *temper* of iron and steel has much to do with the liability of these metals to break in cold weather. It may be as reasonable to suppose that a certain temper would withstand the action of frost, as that it requires a different temper for each particular use to which a tool is put. It is but recently that the proper temper for mill-picks has been discovered; but it is said that now, after artisans have, for generation after generation, carefully studied the properties of steel, with a view to the perfection of this indispensible tool, a pick is produced that is considered perfect. It required years of experiment and scientific research to discover a process for giving the right temper to sword blades; and steel cannon are now made to stand the pressure of tremendous charges, by a certain process of manufacturing and tempering steel for that purpose. The uses to which iron and steel are put are so numerous that it requires a good-sized volume to describe the different processes of manufacturing and tempering for each particular use, and there is no doubt that if manufacturers and users should give attention to the subject, they could produce iron and steel that would do as good service in cold regions as in a mild climate; at least, all wants of this nature are promptly met in this enlightened age when once their importance becomes known to the right class of men.

But if it is not possible to prevent the weakening effect of cold on iron in railroad practice, the damaging effect may be greatly reduced by proper management of road-bed and ballast. Of course it is impossible to prevent freezing, and the injury to track and rolling stock resulting from the rigid condition of the former while in a frozen state must be submitted to. The extent of this injury, however, is greatly dependent on the evenness of the surface while frozen. If the surface is good—that is to say, if the track is smooth, the damage from frost will be far less than when it is badly out of surface, or rough. It is possible to *humor* this condition so that track may be kept comparatively smooth while frozen, by so managing as to make the action of frost uniform, which may be done by exercising care in filling the track with ballast and thorough draining. The effect of freezing is to cause ballast to expand, thereby raising or "heaving" the track "out of surface;" and if the sleepers do not enter the ballast to a uniform depth, frost acts with unequal force, varying according to the depth of filling between the sleepers. It is therefore important that pains be taken to fill the track to a uniform depth. This will aid very materially in keeping track in good condition during the winter, and will greatly reduce the expense of track repairs and the liability to breakage of rails, axles, etc., by relieving them of the sudden and severe shocks incident to a rough track. A uniform *quality* of the material with which track is filled is as essential as the quantity to the prevention of the "heaving" of track by frost. Ballast that consists of a mixture of sand or gravel and clay disturbs track to a greater extent when frozen than clean gravel or sand, as it retains water, and the degree of expansion is much greater than that of dry ballast. A few shovels full of clay or loam will cause track to "heave," and track should not be filled with such material if it is possible to obtain anything better; but in cases where it is necessary to use such material it is better to use it clear than to mix it with sand or gravel. The most serious disturbance of track by frost may always be found on portions of road where gravel has been dumped upon clay, and large quantities of the latter thrown into the track with the gravel. It is often the case that gravel pits are covered to a considerable depth with clay or loam which becomes mixed with the gravel, or if not mixed, there will be a few carloads of very poor material in the same train with a few cars of good gravel. In this way a few feet, or perhaps a few rods, of track are ballasted with good material, and that adjoining it with a substance that prevents the escape of water and, when it becomes frozen, expands more than the dry gravel and is the cause of much damage, in fact is the real cause of rough track in winter. By a little attention the worthless material in gravel pits may be disposed of to good advantage by using it to widen embankments, instead of using good gravel for that purpose, which is often done. Another important matter in this connection is that the sleepers be of uniform thickness, length and width, and placed equal distances apart. This will also aid in giving frost a uniform action, so that its force in raising the track will be equally distributed, thus leaving it in good surface. There are other important advantages to be gained by care in assorting and laying sleepers, which have been explained in former numbers of the RAILROAD GAZETTE.

This matter has not received the attention its importance demands. Many of the terrible disasters occurring in winter are caused by the action of frost on iron and steel, together with the disturbance of permanent way, by its destructive force. Who will say that the recent accident on the Hudson River road is not chargeable to the effect of cold? At all events, the liability to accident from these causes may be greatly reduced by thorough drainage and a proper attention to road-bed and track for that purpose. How far accidents may be prevented by improvements in the process of manufacture of iron and steel remains to be seen.

COMMENTS ON SUNDRY RAILROAD TOPICS.

DISTANCE FROM ST. LOUIS TO ST. PAUL.

In your issue of February 14 you give the distance between these cities *via* North Missouri and Iowa Central roads, at 640 miles. If that is the case, the Rockford, Rock Island and Burlington & Cedar Rapids roads, also just completed, the last rail having been laid on the latter about a month ago, beats it all hollow. By the last route, the distance is

St. Louis to Monmouth, Ill.	172 miles.
Monmouth to Burlington	28 "
Burlington to Cedar Falls	170 "
Cedar Falls to St. Paul	180 "
	550 miles.

There are several changes this way, as there are on the Iowa Central. The time from St. Louis to Burlington is half an hour shorter than from Chicago. These north and south roads have as yet proved of comparatively little value, except as feeders to the lateral roads they cross towards the lakes and the seaboard.

CONES ON CAR WHEELS.

Mr. Wallace gives your readers a most valuable and practical paper on this subject. It is singular how long cones on car wheels have been persisted in, when their use is purely theoretical. It is strange that they have not been the cause of more accidents, particularly on trains of high speed. There is much error in the views of engineers about them. I have known some to maintain that with them, by elevating the outer rail of a curve high enough, a train could be thrown altogether on the inner rail. This would of course depend upon several contingencies, such as are named by Mr. W. As a rule it is incorrect. Wheel cones are the cause of an incalculable amount of jar, oscillation and side-shake, in all the working parts of trains, especially fast ones. Nearly thirty years ago, when on a visit to England, I took much interest in going to way stations to see the fast trains pass them. These trains, running 50 miles an hour, and making the time between London and Liverpool in 4 hours, had just been put on, and the time was the fastest in the world. They would tear by like rockets, swaying from one side to the other as if ready to fly the track at any moment. The Chief Engineer of the road lived near one of these stations, and one day I ventured to ask the great man why the fast trains swayed so? He said that it was owing to the cone of the wheels, and seemed to be much opposed to them and in favor of a flat tread. I have not found occasion yet to differ from his conclusions. Has this subject ever been fully discussed by civil engineers?

THE WESTINGHOUSE AIR BRAKE.

I suppose there is no harm in puffing an invention which has proved to be so splendid a success. The engineers on the Pennsylvania Central declared, last summer, that it had paid for itself over and over again in averting collisions and smash-ups on that road—to say nothing of the saving of life—since its adoption. It has one defect which needs to be remedied, that of being too stiff when slacked off, making the train hard to start, especially with the close-coupled platforms, which are another excellent life-saving invention. If a valve could be added, admitting the air behind the cylinder piston, without complicating the machine too much, it would be an improvement. With the air brake the entire train is at all times under the complete control of the engine-driver, just where it ought to be, and the train is stopped much more promptly than with hand-brakes. It is asserted that a 40-mile train can be checked between two telegraph poles—200 feet. I have seen it done in 600 feet, which is enough for all practical purposes.

OLMSTEAD'S MAGNETIC BRAKE.

This most ingenious machine does not prove a complete success in practice. It introduces an entire new element, electro-magnetism, into the railway system. There are very few experts in this science among railroad operatives, though there are plenty of first-class mechanics. It is, of course, of vital importance that the batteries and connections shall at all times be in prime order. It will not pay to detail experts for this purpose alone. It is also objected that the magnetic adhesion is too violent and sudden, bringing everything up standing with a shock, or else something breaks just when it ought not.

The Chicago, Burlington & Quincy road, one of the most progressive in testing all new things, tried it on their Mendota accommodation train last year, and, it is reported, took it off in December last, replacing it with the air brake. If continued and severe tests prove the Westinghouse apparatus to be permanent, and the air cylinders do not cut, or otherwise wear out too soon, Mr. W. certainly has a "big thing" in his invention. I don't know a more worthy man to deserve success, and hope he may have it, with all my heart, if only for the sake of the lives his invention will save.

HEWITT'S STEEL-HEADED IRON RAIL.

This gentleman came back from the Paris exposition of 1867 with this kink in his head, and promulgated it through the New York *Tribune* as the biggest thing in the world. He now roars you as gently as any sucking dove, and says that he has advised (?) the Erie Company, which he advised to introduce it, not to use it any more—which was certainly kind of him. This result is not at all unexpected to those familiar with iron rolling. The fact is that iron and iron, or iron and steel, are seldom welded at all in rolling. The bars are only squeezed together, and they are always ready to scale or laminate and part company on the slightest provocation. That is what is the matter with Mr. Hewitt's rail with steel head, and this fact is well known among those who have investigated the subject.

THAT LOOSE WHEEL DEVICE.

What awful railway tragedies are enacted by wringing and twisting of axles! There was that of Abergele, in Wales, several years ago, and now that of Wappinger Creek, on the Hudson River. Can not axles be mounted and yet not be subject to so much slip and twist? I do not believe a loose wheel axle will make any more trouble with a stone or other slight obstruction on the rail than a tight wheel would. Both would act exactly alike in that respect, and that is the reason why trucks or bogies of two or more pairs of wheels are used. How a loose wheel would or could leave a rail more than a tight one, I do not understand, though I can comprehend many advantages they would have.

OCCIDENT.

THE EDUCATION OF LOCOMOTIVE ENGINEERS AND MACHINISTS.

There is much ignorance of principles in many practical employments. We can see, upon the slightest observation, that there is a volume of geometry and natural philosophy in the construction of a steam engine; that there is an entire chemical science in the combustion of fuel and the generation of steam; a whole treatise on the laws of motion and resistance—of inertia, momentum, and central forces—in the movement of an ordinary passenger train. Yet how many ordinary enginemen and machinists are there who are either geometricians, chemists, philosophers, or mechanicians? We may say there are but few, and we may ask why should there be more? Let us see. It is not *necessary*, certainly, that the toiling operative in a cotton mill should know how to design and construct a loom or a spinning frame; it is not practically essential that the hard working iron-puddler should be able to analyze the chemical operations in his furnace, and to lecture upon the chemical constituents of fuel, the laws of heat, oxidation, and other kindred subjects; but it is easy to see that he would be socially elevated were he able to do so, that he would become an interpreter of nature, that his toil could attain the dignity of a "profession," and that he would be no longer the mere physical element that he now is, in some wonderful operation of nature.

It is true that there is no absolute remedy, upon practical grounds, that mere laborers, although acting in conjunction with the most complicated and wonderful combinations of machinery, should fulfil any other than a mere physical function in their employments. The lever need be but a lever, though it be a human lever; the blow upon the pliant work is the same in kind when the source is in the ponderous engine, as when it follows the action of human muscles.

But when a practical employment requires something more than a single degree of skill, something more than the continued repetition of a single operation; something, perhaps, in which a shade of uncertainty attends each stage of work—there could be no help like that of

a knowledge of principle—a knowledge that would not only direct the action, but that could foretell, also, the result.

A locomotive engineer is entrusted with a complicated and valuable machine, requiring not only constant attention, but close judgment; while, at the same time, attention must be equally devoted to keeping a sharp lookout on the road. Amid many and strict duties, and under a heavy responsibility for life and property, it would seem that an engineer should possess especial knowledge relating to his occupation, not only in its practice, but in its principles. Where the least error or neglect may cause immediate destruction, or, looking to less fatal consequences, may produce loss and unnecessary wear and tear of a valuable machine, and where, upon a great road, there are as many possible sources of danger and loss as there are engineers, it would seem that no discipline could be too rigid, and no qualifications too complete, for the proper discharge of an engineer's duties. A steamer at sea has its captain, pilot, and engineer; but the locomotive engineer is captain, pilot, and engineer for a freight of human lives, and for the protection of property, the one as numerous and the other as valuable, often, as upon the greatest craft upon the ocean.

But what is the usual education of such men? Forced, from mere childhood, to the stern necessity of labor, they seek employment as laborers, perhaps, on a railroad. Upon a little acquaintance, and by some importunity, they afterwards obtain a fireman's post. Here, as slaves of a great machine, they acquire whatever knowledge is to qualify them afterwards to act as engineers.

I doubt whether so numerous and so useful a body of men as American locomotive engineers are to be excluded from the advantages of technical instruction, so far as relates to the principles of their own occupation. I cannot believe it to be expedient, either for the railroad interest or for the proper position of this class of men, that their qualifications should be so restricted and so mechanical as they have been. The most practicable plan I have ever seen proposed to supply the want of instruction to this class of men, is that of employing suitable persons to meet the engineers and firemen at the engine and repair stations of the road, and there to explain and illustrate the great elementary principles of mechanics and of the steam engine.

The men themselves, once interested in the subject, would pay the expense of such a course by a small contribution from each one. The instructors must be men well qualified, and next to that must become itinerants in their profession, moving wherever they can be most useful, holding social and colloquial intercourse with the men, adapting themselves to the capacity of their audience, making no pretensions, but being willing themselves to learn in practice, as they often may, from the very class of men whom they undertake to teach in theory. F.

The Creamer Brake and the New Hamburg Accident.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue February 18, I noticed an article in relation to the Creamer brake, in connection with the late accident on the Hudson River Railroad, in which the author stated that the engineer called for brakes when a thousand feet from where the accident occurred. In this instance, the Creamer brake is, by the writer, censured and denounced for the fact that it did not stop the train.

Now allow me to make the inquiry, would it not have resulted the same had there been any other kind of brake attached to the train, and *those* brakes not in operating condition? I imagine it would have resulted the same, under the same circumstances.

The Creamer brake will stop a train, if it is in good condition, in running one thousand feet, or in less distance.

The Creamer brake is very easily and readily applied when in good order, and if all branch lines are properly attached to the bell cord, there is no difficulty in applying them at any point on the train, either by the conductor, brakeman or engineer; and in this instance, instead of the engineer calling for brakes, he could have applied the Creamer brake in less time perhaps than any other person on the train, and this he should have done instead of calling for brakes. Should the engineer see the necessity of applying the Creamer brake himself, in case of danger, he should not, at any time, whistle on brakes, for in that case a brakeman operating the hand brake would be in great danger of being thrown from the platform of the car, or otherwise injured, provided he had the brake-wheel in hand when the engineer pulled the cord for setting brakes.

If, on the other hand, the brakes were not in order, then who is responsible?

There is not a brake in existence that will perform as it should and have the desired effect if it is not in good operating condition, and cannot be depended upon—one kind of brake more than any other. It is unjust in the extreme to condemn a brake, or any other piece of machinery, when not kept in good working order.

R.

"Protection for Civil Engineers."

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am glad to see that this matter is being publicly agitated, since I think there is danger of doing more harm than good by any hasty procedure. After considerable reflection, I am unable to perceive how a State law can be of much benefit to an engineer, while it may cause him some embarrassment and compel him to pay a small fee.

To define the knowledge which a civil engineer must possess before receiving the permit of a State board to practice, would require an extended and carefully drawn enactment; for the mechanical, the hydraulic, the mining, the railway, and other departments of our profession call for differing measures of information upon the various subjects, depending upon the work which the engineer may have in hand. Let us suppose, however, that the law defines with minuteness, a certain range of knowledge which a civil engineer must possess; could this law prevent any person, who is spending his own money, from employing one who does not know all these things, if he thought the practical skill possessed by the unlearned individual was sufficient for his purposes?

It is well known that already, in several of the states, any man of good moral character may practice law; but we do not on this account find that those who are really instructed and capable are neglected for the ignorant and incapable, and, as the general information of society increases, the more men will be able to estimate for themselves the capacity of those whom they employ, and the less need will there be for boards of examiners to pronounce upon their qualifications.

A man of real ability does not need to be protected by any law; he will make his own way against pretenders; if he does something well, or better than a pretender can do, the world will find him out quite as certainly as if he had been examined and certified to by a State board of commissioners. Therefore, until further enlightened, I shall go for "a fair field and no favor" for civil engineers.

Yours, very respectfully,
ARCHIMEDES STEVENSON WATT.

The Action of Steam in the Cylinders of Locomotives.

BY FRED. J. SLADE.

[CONTINUED FROM PAGE 508].

Expansion.—The theoretical advantage of cutting off the admission of steam before the piston has completed its stroke, and allowing that confined in the cylinder to expand, and in so doing to perform an amount of work without the withdrawal of fresh steam from the boiler, is well understood. The results of practice and of direct experiments show, however, that in general the full theoretical gain cannot be realised. If we were to weigh carefully the water evaporated by an engine in a given time, and were also to take a continuous series of indicator diagrams during that time, and to ascertain from these the pressure in the cylinder at the moment of opening of the exhaust port, and thence compute the weight of steam discharged, we should find that a considerable proportion of the water weighed out to the engine was not accounted for by the indicator. This instrument can only take account of live steam which is capable of exerting pressure, and we are led, therefore, to the conclusion that a considerable proportion of the steam supplied to the cylinder is condensed in it, and discharged in the form of spray.

There are three causes which operate to produce condensation in the cylinder, viz.:

1. Radiation and conduction of heat from the cylinder.
2. The reduced temperature of the cylinder from the effect of the lower pressure of the steam after expansion and during the exhaust.
3. The conversion into work of an amount of heat equivalent to the work performed by the engine.

The first of these may be reduced, if not entirely prevented, by efficiently lagging the cylinder, or by so placing it in the smokebox, or otherwise, that the escaping gases from the firebox may circulate around it. In engines with inside cylinders this is partly done, though the heads are still exposed as well as the lower sides. The Americans, who use none but outside cylinders, not only lag the body of the cylinder flush with the flanges with wood, but cover the lagging and also the cylinder heads with a casing of sheet brass highly polished, which is probably almost as effective in checking radiation as the more unequal protection afforded where the cylinders are placed in the smokebox. It would be quite possible to heat the cylinder to any desired temperature by the hot gases in the smokebox, but it is found that where this is attempted there is a great tendency to cut the cylinder or injure the piston packing. In a well-lagged cylinder it is not probable that this source of loss is very serious. In any case it is not a loss peculiar to the act of expansion, but is common to all modes of working the steam, though it is greatest when steam of high pressure is used, and increases with the size of the cylinder, so that it may be said to be somewhat greater in amount proportionally to the quantity of steam used when the steam is worked very expansively than when it is admitted during the whole stroke in a smaller cylinder to obtain the same amount of power. A lagging to be sufficient should be composed of some substance which will retain the heat imparted to it by the hot steam in the cylinder, and not suffer it to be dissipated by conduction, radiation, or convection. Hence the plan that has in some cases been proposed and tried of allowing the exhaust steam in escaping to encircle the cylinder is essentially bad, since on account of its low temperature (in the case of steam of 100 lbs. pressure 125° below the temperature of the steam in the cylinder), it in a condition to abstract heat copiously from the cylinder, and as it then passes into the air to be replaced by fresh discharges of cool steam, all the heat so absorbed is entirely lost, which would not be the case with a fixed lagging.

The second cause is one which cannot be prevented by lagging, as it arises from the properties of the steam itself in the various changes which it undergoes. It could be obviated by warming the cylinder from some external source of heat, but, as already mentioned, this is not usually attempted. In estimating the amount of this loss it has often been assumed that the temperature of the cylinder must be a mean of the temperatures of the steam at equal intervals of time during a complete double stroke of the piston, or while filled with live steam and while exhausting. The following considerations, however, will show clearly that although it may be difficult to ascertain with precision exactly what temperature the cylinder acquires under the changes of pressure the steam undergoes, this assumption, at least, is far from correct. When the cylinder is in contact with steam of a higher temperature than its own there is a practically unlimited supply of heat, latent and sensible, to be yielded to the metal as long as there is any difference of temperature between it and the steam. When, on the contrary, the cylinder is the hotter body, the amount of heat which can be absorbed by the steam is only that which will suffice to raise the temperature of the quantity contained in the cylinder to a temperature equal to that of the metal, and as the weight of steam is small, and its specific heat only moderately high, it is evident that a very small quantity of heat will suffice to raise its temperature to this point. Thus, if we suppose the weight of steam contained in a cylinder at the commencement of the return or exhaust stroke, when its temperature is lowest, to be 0.11 lb., the quantity of heat required to raise the temperature of this steam 100° would not lower the temperature of the cylinder ½°, supposing the heat to be derived from 100 lbs. of the metal, an effect only equal to the evaporation of 1–12 oz. of water. Did the cylinder, therefore, contain nothing but pure steam, its temperature would practically be that of the steam as admitted to it from the boiler. But this is not the case in fact, since, unless superheated steam be employed, there is always an amount of water deposited in the cylinder resulting from the various causes of condensation which have been already enumerated. This water, as the pressure is reduced in the cylinder, will be evaporated, and, in so doing, abstract from the cylinder an amount of heat equal to its latent heat, minus the slight decrease of its sensible heat, due to the reduced pressure. The conditions in this case are more analogous to those existing when the cylinder is in contact with live steam from the boiler, and the temperature of the cylinder resulting from these opposite influences will depend on the relative rapidity with which the condensation and re-evaporation take place.

When steam is brought into contact with a surface colder than itself, it undergoes condensation with extreme rapidity, and, in so doing, imparts to the colder body its large store of latent heat, thereby raising its temperature as rapidly as it is possible, from the nature of the substance, for it to receive heat. That this condensation of steam, and consequent heating of the colder surface, takes place with such rapidity is due to the fact that the collapse of a particle of steam, on being condensed, makes way for the approach of another which instantly flies to occupy the little vacuum so formed, and as this action takes place in an almost immeasurably small period of time, the cooling surface is kept in constant contact with fresh particles of steam, or, can at most, be separated from them by but a thin film of water resulting from the condensation which takes place. We have, moreover, practical proof of the rapidity of this action in the operation of surface condensers, which, though usually having much less surface than the boilers in which the steam is generated, and a less difference of temperature between the condensing water and the steam, than between the hot gases in the fire-box and flues of the boilers and the water undergoing evaporation, are nevertheless able to condense in a very brief interval of time, all the steam which the boilers can generate in the time of one stroke of the engine. It follows from this, that the surface of the cylinder and piston with which steam is in contact when the communication with the boiler is open, must acquire a temperature little less than that of steam at the pressure under which it enters. The water resulting from the condensation that takes place is deposited upon the surface of the cylinder as a film in the form of dew, and as the steam expands and its pressure and temperature are lowered, this is re-evaporated at the expense of the heat imparted to the cylinder in its condensation. In this operation, however, the action is much less rapid than in the act of condensation, since the particles of steam as they are formed adhere for a time to the surface, until they become large enough to detach themselves, and thus greatly retard the transmission of heat to the remaining particles of water.

We are all familiar with this effect wherever water is seen in contact with heated surfaces, and where the temperature of the hot surface is not greatly above the boling point of the liquid, the bubbles acquire considerable size before bursting. Admitting, then, that the process of re-evaporation takes place more slowly than that of condensation it follows, since the same amount of heat must be abstracted from the cylinder by the one as was imparted by the other process, that its temperature must be considerably *above* the average temperature of the contained steam.

The condensation of steam, which takes place, therefore, during the first part of the stroke, will be measured by the quantity of water which the cylinder is capable of evaporating during the latter portion of the stroke, and during the return stroke, since, as already intimated, it is this operation which, by cooling the cylinder, causes the condensation referred to. It would be possible to ascertain this quantity, with a tolerable approach to accuracy, by experiments on the quantity of water evaporated from the surface of plates maintained by artificial means, at a temperature nearly equal to that of steam of the boiler pressure. The diagrams, Figs. 4 and 5, give interesting testimony as to the tem-

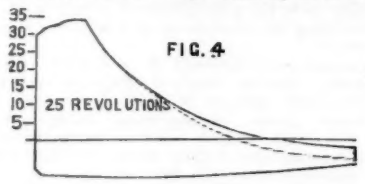


FIG. 4

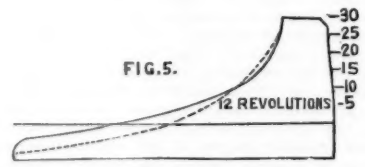


FIG. 5.

perature acquired by the cylinder. The curve in dotted lines, as will be presently examined, shows the pressures that would have existed had no condensation or re-evaporation taken place. The initial pressures in the two cases are respectively 33 lbs. and 30 lbs., and it will be seen that the actual expansion lines fall more rapidly than the theoretical curve till the pressure reaches, in the one case 16½ lbs., and in the other 15 lbs., when they begin to fall less rapidly than the latter, indicating that above those pressures condensation was taking place, while below them the water deposited was being re-evaporated. The temperatures corresponding to these pressures are respectively 25° and 24° below the temperatures of steam of the initial pressures, the temperatures of steam of the pressures during exhaust being 116° and 109° below the initial temperatures. These diagrams are from engines working at the slow speed of 25 and 12 revolutions per minute, with the steam cut off at one-sixth the stroke, and consequently affording much more time for evaporation and consequent cooling, during the latter part of the stroke, than would be given in a locomotive, and in the latter case, therefore, the temperature of the cylinder would be nearer to that of the boiler steam pressure.—*Engineering.* [TO BE CONTINUED.]

Dangerous Freight Cars.

The matter of a brakeman killed, on the New York Central Railroad, while shackling freight cars, has received from that corporation a verdict of $3,500. The ground taken by the jury was that the cars were so constructed as to be unnecessarily dangerous.

Without reference to the merits, or the important legal questions involved in this particular case, it is to be hoped that it will be the means of leading the directors of railway companies to look for themselves whether their arrangements for the coupling of freight cars are such as ordinary humanity requires, and whether the cheek blocks on the end of freight cars project far enough to preserve lives of brakemen whenever the buffer irons give way or prove defective. Many human beings have been crushed to death between freight cars. A measurement of cheek blocks on the New York Central freight cars show that, in some instances, these cheek blocks project only 3½ inches, sometimes only 4½ inches, and sometimes only 6 inches. Thus, if the buffer irons of opposite cars should be broken, and the cheek blocks come together, there would in some instances be, for the brakeman, a space of only 7 inches, sometimes 9 inches, and sometimes only 12 inches. Now, according to the testimony of experienced brakesmen, as well as medical testimony, 16 inches is the very least space into which a brakesman should be asked to stand, especially as the freight cars frequently come together with great force.

At the trifling expense of one or two dollars on each car, each cheek block could be made to project 8 in., and thus secure for the brakesman a clear space of 16 in., even if both buffer irons were broken off or driven back under the cheek blocks. This ought to be done with each new freight car, and with the old ones whenever brought into the shop for repairs; and thus in one or two years every freight car on the road would be so constructed as to save the lives of brakemen and save the company from the appearance of needless cruelty and from expensive lawsuits. Experienced brakemen think the danger attending the coupling of freight cars is unnecessarily increased by allowing the ends of the side sills to project beyond the cross sills, into the space through which brakemen must pass when going in between cars to couple them, or when attempting to come out. In view of the great number killed or injured while coupling cars, we think rail-car masters and master mechanics should give this matter serious attention. —*American Railway Times.*

J. H. SIMMONS,

ENGINEER PACIFIC EXPRESS TRAIN,

Died at New Hamburgh, N. Y., Monday night, February 6th, 1871.

At the inquest at Poughkeepsie, N. Y., February 10, Nicholas Tallon, fireman of the Pacific express train, testified of the engineer as follows: "He blowed brakes, and said, 'Nick, put on them patents;' he meant the patent brakes; I pulled three yards of bell cord. * * * I got down on the steps and asked Doc if he was going to get off. Doc looked around at me, but made no reply, and then looked ahead again, watching his business."

The wind blows cold, the stars shine bright,
The ice-bound river glistens,
Where flying onward into night
The life-train madly hastens.

On, on, past hamlet, town, and wood
That fringe the frozen river,
As some infuriate demon would
Glide, roaming on forever.

On into night, with fiery eye,
Its sinuous body dashes;
With iron muscles, pulse of steam,
It plunges, screams and crashes.

Yet a great soul inspires the hands
That guide its onward motion,
As starting from Atlantic lands,
It seeks the Western ocean.

And steady stands the engineer,
True to his fearful duty;
And glancing back among the cars,
Where ride babes, age and beauty.

He feels that loving human hearts
Are in his watch and keeping;
And though he guides to joy or death,
They trust him by their sleeping.

Then firmer grasps the iron bar;
His noble heart thrills faster—
Great God! is that the signal light
That tells of near disaster?

Then on the air the whistle shrieks
Like some lost soul despairing,
And onward to its death-doom flies,
Past earthly aid and caring.

The Spartan hands reverse the valve—
"Put on the patents, Nick!"
"We'll do the best we can to save
Our passengers; be quick!"

The bridge is reached: "Doc, will you jump?"
A glance, but no replying;
Then fixed his eye where duty called,
Though its path led to dying.

A crash! a flame leaps into air,
And laps the sundered timbers,
And wailing voices echoed there,
Where souls died with the embers.

And babes, and youth, and kindly age,
And manhood's stronger glory,
Returned to Him who seals the page,
Of each such frightful story.

And he who clasped the guiding bars
To death, unswerved from duty,
Shall wear in Heaven the crown of stars
That waits heroic beauty.

For Christ, who died that men might live,
And dying claimed our loving,
To man who dies for men, will give
His welcome and approving.

G. R. BLANCHARD.

BALTIMORE, Md., February 14, 1871.

—*New York Evening Post.*

Vermont Central and Northern Transportation Company.

Another important step has been taken toward consolidating the various transportation interests between Boston and the Northwest. It is announced by authority that the Northern Transportation Company has passed into the hands of parties representing the Vermont Central line, which includes the several companies forming the through route from Boston by way of Lowell, Nashua, Concord, St. Albans to Ogdensburg and Montreal, and is to be distinguished from the Vermont Central Railroad. The manner of the transfer is understood to be the purchase of the interest of Philo Chamberlin, Pre-ident of the Northern Transportation Company, and the owner of a controlling portion of the stock. Governor J. Gregory Smith, of Vermont, President of the Vermont Central Company, is, of course, the man whose courage and foresight have brought about the important combination, and his genius will preside over its operations in the future. We intimated a few days ago that the lease of the Rutland Railroad was but part of a great movement aiming to consolidate all the lines between Boston and the Pacific coast. The absorption of the Northern Transportation Company supplies the missing link so far as the chain has been completed, and gives the St. Albans people control of an unbroken line from Boston to the eastern terminus of the Northern Pacific Railroad.

The character and extent of the Northern Transportation Company are well known to shippers and merchants in this section, if not to the general public. Although the field of its operations is some distance from Boston, it is an important factor in the problem of cominunication between Boston and the Great West. The nominal capital of the company is between eight and nine hundred thousand dollars, and its fixed property and real estate are valued at over one million dollars. The company controls about twenty first-class lake steamers and does a large business in both freight add passengers between Ogdensburg and Chicago and other Lake Michigan ports. A weekly line is to be established to Duluth, and these facilities will of course be enlarged when the opening of the Northern Pacific Railroad renders Duluth one of the most important ports on Lake Superior. A large quantity of the stock of the company is owned in Boston, and the holders will be keenly interested in the pending change. To the city at large the problem is one which comprises the subjects of quick and cheap transportation and the advantages which it secures to her in competition with her seaboard rivals. We hope those who are attempting to solve it will not be discouraged by the swiftly succeeding developments.—*Boston Advertiser.*

Boiler Explosions.

The explosion of a steam boiler is *prima facie* evidence of carelessness in its construction, or in its maintenance, or in its use. It is so regarded by the engineers, and ought to be so regarded by the law. It will be easy to convince any one who will examine the records of boiler explosions and inquire into the means of preventing them, that no injustice would be done to the owners of boilers by indicting them for criminal carelessness in all cases of explosion.

The history of boiler explosions is authentic and definite. The boiler has usually been erected under the full light of modern science. All the attending circumstances of the explosion have been immediately communicated to the public; curiosity has aided science in making every man an investigator of these circumstances and a searcher after causes; public and private commissions have been appointed to examine the subject generally; numerous legal tribunals have gone to the bottom of special cases, and innumerable private professional observers have witnessed results, searched records, weighed evidence, and arrived at general conclusions. All the plausible theories of explosions have been not only looked into, but worked out, in many cases experimentally or theoretically, to their ultimate limits.

Now the remarkable and unprecedented result of all this investigation is, not the division of any large body of experts into schools; not the building up of rival theories, but the universal conviction of all concerned, that boiler explosions are certainly in most, and probably in all cases, the results of malconstruction or maltreatment, and of nothing else, and that the usual immediate cause is the unchecked deterioriation of the boiler in service. In the great majority of cases the evidences, of carelessness are as plain as the time of day on the face of a clock—a sheet furrowed nearly through; a stay-bolt rusted off; a crown-sheet insufficiently supported; expansion and contraction unprovided for; water connections stopped up; bad material—some one of the many obvious and certain conditions of rupture. In a few cases the immediate causes are not apparent, and then the electricity theorists, and the gas people, and the mystery men fight over the remains in the newspapers; and the only reason why simple neglect is not discovered to be the cause, is that the parts of the boiler which would otherwise reveal it, are blown away, or are too much mutilated or obstructed to be legible. Simple bad treatment by the maker or user will account for the original rupture which ends in any explosion, however terrific may be its effects. There is force enough restrained within every steam-boiler running to-day to perform the most terrible work of ruin that any similar boiler ever performed in exploding. When this force is once released, the amount of destruction depends on the point of rupture, the resistance, the surroundings, and on an infinite number of circumstances mostly outside of our control. The only thing we can do, and it is enough, is to keep the resistance superior to the normal pressure.

Now that the causes of boiler explosions are so well understood as to be a matter of commercial calculation —where companies make money by insuring such boilers as are constructed and maintained according to established professional rules—it is to be regretted that the government should stand helplessly by, and see scores of people scalded to death every few weeks for the want of an adequate law and a system of inspection. Boiler insurance and inspection companies—and they are no new or experimental thing—simply prove that boilers constructed and maintained according to certain well-known rules, are practically safe—that the chances of explosion, even with ordinary water-tending, are very remote, and they stake their money on this knowledge; and yet the United States Government has been unable to even check the increase of these disasters. If Congress cannot at once provide for the security of the public against boiler-explosions, it had better let out the job of protecting its citizens to some insurance company, and then it will be done on scientific principles, and by competent men.—*New York Times.*

Train Signal Light.

A signal light, to be attached to the rear of trains, invented by two officers of the Little Miami Railroad, has lately been tested on that road. It is thus described:

"In the centre of the roof of the rear car of the train, over the rear axle, is placed a square lantern, with alternate panes of red and white glass. The lantern is connected by means of a shaft with one of the axles in such a manner that eight revolutions of the axle produce one of the lantern. When the car stops the lantern of course ceases to revolve. Upon each side of this main lantern are two others, also connected with the axle in such a way that when the train is moving forward a solid red light is displayed, and if backing, a solid green light. The engineer of a train coming up in the rear can thus tell, by observing these lights, whether the train before him is moving or at a standstill, and if moving, in which direction."

—Walter Hatch, late Superintendent of the Portland & Kennebec Railroad, died in Augusta, Me., on the 18th ult., aged 43 years. Mr. Hatch's first experience on a railroad was as brakeman on the Eastern Railroad of Massachusetts. He entered the service of the Portland & Kennebec company in 1851, and left it on account of ill health in 1869.

AMERICAN LOCOMOTIVES.

The following is a copy of a letter which Mr. A. Brunner, of Montreal, Canada, has contributed to the *Engineering*:

The American railroad engine, as compared with European locomotives, bears upon its face the stamp of much fertile originality, similar to that of American steamboats and bridges, when confronted with transatlantic works of a kindred class. There are differences in the construction and working of American means of land and water intercourse which may be called only external ones, arising from the peculiar tastes and manners of the people; but, between American engineering practice and that of the old country, there are also principal distinctions called for, often, by strictly limited expenditure, by the necessity of speedy completion, and dictated in many cases by nature herself.

It is on the American continent that some of the grandest wonders of the world, of nature and of art, simultaneously appear before the traveler—whether he be traversing endless prairies and the Sierra Nevada on the Pacific Railroad, or skirting on a "floating palace" along the beautiful scenery of the American Rhine—the Hudson River. And probably there is no other place on the whole globe where such an impression of might and majesty is left upon the mind—no other spot where such a sublime scene of external power and of mortal effort burst upon the view as at the Falls of Niagara and the Suspension Bridge. It was a bold idea to stretch such a wonderful structure as was completed by Mr. Roebling across Niagara River, which signifies, in the symbolical language of the Iroquois Indians, "Thunder of Waters," streaming deep below the table land through its rocky bed, and boiling and leaping and foaming onward to the whirlpool. And there is also the new and graceful, though less monumental, Clifton Bridge, suspended like an iron cobweb over that tremendous ghost of spray and mist that perpetually arises from the bright green water in its giant leap!

Such challenges and many other difficulties the American engineer has met with, developing an amount of pluck and mechanical instinct which—as must be universally admitted—do him much individual credit and honor the whole nation. But to return to our subject, viz.: "American locomotives." I have examined them in detail at the manufactory, witnessed their performances on all kinds of track, and I am compelled to confess that what I saw far exceeded my anticipations.

Beginning with the engine and the various mechanical details, as designed and constructed in the manufactory, a very marked difference, as compared with English practice, will be noticed. The boiler is invariably lighter, the maximum thickness of the iron plates composing the barrel and fire-box being $\frac{3}{8}$ in. (with the exception of the tube plates, $\frac{5}{8}$ in. thick), while steel plates $\frac{1}{4}$ in. to 5-16 in. are frequently used. The boiler tubes are generally of iron. The longitudinal seams of the boiler and fire-box casing are double rivetted, and they are, moreover, strengthened, in many cases, by flat bars of iron, placed sometimes across the joint at short intervals, sometimes right along the joint on the inside of the boiler. The fire-box crowns are usually stayed by transverse stays, composed of two plates $\frac{5}{8}$ in. thick, which are welded together at the ends, these stays being connected to the crown of the fire-box casing by sling-links. The fire-box casing is generally raised above the boiler barrel, and the junction between the two is effected in a simple manner by the "connection sheets" forming a short conic barrel, and dispensing thus with the tedious operation of molding the front casing plate to any intricate shape. No solid wrought iron rings are interposed at the fire-door and fire-box bottom, but the plates are flanged so as to meet when they are rivetted together. The smoke-box is usually cylindrical, forming a combination of the boiler barrel, and resting on a cast iron saddle, which carries in its turn the cylinders, and, in some cases, also the bogie pin.

One of the peculiarities in American locomotive construction is the framing which is made of square bar iron, welded together, slotted, planed all over, and entirely finished. The "bar frames," besides being very rigid in every direction, admit of easy access to the link motion; they form at the same time a good base for attaching the various brackets and guide-plates. The cylinders, which are usually outside, are hung from the top bars of the frames. In order to insure a firm base for the cylinders, and to prevent independent strains on the frames, a cast-iron separate bed-plate or "saddle" is inserted between them, or the cylinder castings are made to extend inwards, where they are firmly bolted together. The valve-chests are on the top of the cylinders—a very good plan by-the-by—the valves receiving their reciprocal motion through the intervention of rocking shafts, from the eccentrics and motion links, which are placed, as in English engines, inside the frames.

As a rule, the various details of the motion and gearing are admirably well proportioned and carried out, although, for the sake of cheapness, "professional etiquette" is sometimes grossly neglected, as witness cast iron piston-rod crossheads cast in one piece with the pin and guide blocks! The ends of the connecting and coupling rods, where they take hold of the crank pins, are always fitted with straps, secured similarly to the large ends of the connecting rods for inside cylinder engines. The brasses are generally closed on the outside, so that the crank pins may be entirely enveloped, and by this "dodge" (which is well worthy of imitation) the pins are kept out of the way of dirt. An attempt is often made to guide the piston rod crossheads by bars, arranged *above* the center-line of the cylinders, as shown by your illustration of a goods locomotive for the Pennsylvania Railroad, on page 156, vol. vii. Sometimes a single guide bar only is employed, care being taken, however, to give it the necessary rigidity, and to provide ample bearing surfaces for the upward thrust and downward pull of the connecting rod. The object of this arrangement, which is identical with the plans of Mr. Shoudley and of Mr. Reynolds (likewise illustrated in *Engineering*), is to clear the bogie wheels, or to the effect, in the case of an engine with the leading wheels coupled, a reduction of the distance at which the cylinders are apart transversely.

The cast-iron wheels form another distinctive feature in American practice. The small chilled cast-iron disc wheels of their engine, tender, and car trucks answer admirably well, being cheap, strong and durable at the same time; but, as regards the driving-wheels with hollow spokes and rim; they are, after all, but a primitive contrivance as compared to the solid wrought-iron wheels now manufactured to such perfection by the leading British locomotive makers, and especially by some Belgian and French firms. To turn out a really good wrought-iron wheel, special tools and appliances, and superior manual skill, are indispensable; and it is, perhaps, the lack of these that has prevented the Americans from making an attempt in this direction.

The boiler feed-pumps also deserve mention, injectors being totally ignored, or, if employed at all, of such dimentions as to serve merely as auxiliary boiler feeders. The pumps are always placed on the outside of the frames, and, frequently, even outside the coupling rods, in which latter case they are bolted on the guide-bar brackets, being thus of very easy access. The pumps are usually worked from the piston-rod crossheads, and they are provided with two air chambers, one for suction and one for the delivery-pipe.

Much ingenuity is displayed in the manner of setting the engine and tender on the wheels; in fact, the problem of making an easy riding engine, offering, at the same time, the least amount of internal resistance, has been solved by the Americans most successfully. Much might be written on the history of the swivelling-truck, the faithful "track feeler" of the American locomotive; and it would take a very graphic pen, indeed, to record fully all the modifications and transformations this useful contrivance has already encountered. Swivelling-trucks—better known, perhaps, by the quasi-mysterious name of "bogies"—are employed as carriers under the engines, tenders, and cars on all American railways; but, as far as I could learn, no attempt has ever been made to utilize the advantages of the bogie system in that part of the engine which, properly speaking, supplies the traction power; in other words, the steam cylinders and gearings are always fitted to the main system of the engine, independent of the bogies. If the trucks, as they roll along, are watched from the car platform, it will be noticed that they get the more uneasy the more the speed increases, manifesting, at high speeds, a strong "galloping" movement; and this characteristic phenomenon would, perhaps, be seriously aggravated by the additional disturbing forces resulting from the employment of steam-cylinders. At all events, the check-chains provided throughout, in connection with the American trucks, are not suggestive of abundant safety. For heavy work at very slow speeds, however, such as climbing crooked inclines, it would be advisable to employ engines mounted upon two steam-trucks, whereby both the power and the flexibility of the locomotive would be increased. Compensating levers are used on all American engines, not only between the coupled driving-wheels, but often, also, between the front pair of coupled wheels and the bogie. In many cases, the equalization of the weight is still further carried out by the employment of transverse compensating beams, as used also by Borsig, and on almost all the German locomotives.

As regards the general form of American locomotives the most striking feature is the extent to which the weight is subdivided over a greater number of wheels. The standard passenger engine has invariably four coupled driving wheels, one four-wheeled truck under the forward part of the locomotive, and two four-wheeled trucks under the tender, making in all sixteen wheels, against the ten or twelve wheels of an English engine of similar proportions. On some lines the goods traffic is worked by exactly the same type of engine, the increased traction power being obtained merely by a slightly reduced diameter of the driving wheels and a few tons more adhesion. But what may be termed the "standard" goods engine, has generally six-coupled driving wheels of from 4 ft. 3 in. to 4 ft. 8 in. in diameter, while the driving wheels of the passenger engine range from 5 ft. to 5 ft. 8 in. in diameter. The weight of the passenger locomotives, loaded, is from 27 to 30 tons, of which weight 60 to 65 per cent. rest on the coupled wheels. The weight per driving wheel on the goods engine is very seldom more, but having, usually, two coupled-wheels more, the adhesive power of the goods engine would consequently be 50 per cent. greater than that of the passenger engine.

In outside appearance and finish, the American locomotives present much original conception and, not unfrequently, real artistic merit. The Yankees seem to place great pride in their engines; and it is indeed a proud sight to see an American engine entering a station, blazing in polished brass, embellished with rich *peinture*, bells ringing, and whistle roaring—a sight very apt to compensate, temporily, for the noted shortcomings of American stations. At first glance, some of the accessories that give so much individuality to the engine, as cow catchers, original bells, tremendous head-lights, and mighty steam whistles, may appear somewhat superfluous; but this idea is soon dispelled when a journey is made on the engine foot-plate. It will then be seen that there is nobody to keep the track; at way crossings there is no barrier of any kind, but a board is stuck up instead, bearing one of the following warning descriptions: "Railway crossing!" "Look out for the engine!" or, as here in Lower Canada: "*Traversee de chemin de fer!*" The well known voluminous smoke-stack is necessary on account of some kinds of fuel consumed, while the commodious "cabs" shelter the men through summer and winter in the performance of their arduous duties.

We will now proceed to witness the performance of American engines. One of the most striking observations is the ease, not to say "grace," with which the comparatively light locomotives do their work—and heavy work too—over the rough roads of the United States and Canada. Mr. Eugene Flachat is evidently of the opinion that engines are worked at the sacrifice of regularity, speed and security, for, on page 229 in his "Traversee des Alpes," he says:

"The American locomotives are not constructed on a system that gives them a superior power to that of other engines—they are used on the inclines to the maximum of their power and adhesion.

"This produces an irregularity in their running which would not be admissable with the great number of trains on our lines, nor with safety, which is the matter of first importance in this mode of traveling.

"The American engine and trains are to be compared to a ship crossing the ocean; she sails fast when everything is favorable; she goes slowly when the work is increased by the variations of the profile; she overcomes great inclines by reducing her speed considerably, without the machine being endowed with any superiority as to the production of steam or the means of transmitting the motive power of the cylinders to the wheels."

The average gross tonnage of passenger trains here is probably double that of English trains. Still, with from six to seven passenger cars, weighing, loaded, about twenty tons each, a baggage car of the same weight, and a Pullman drawing-room or sleeping car of from thirty to thirty-five tons weight, the engine gets quickly away from the stations, and without "slipping." Of course there must be some material reason to account for the superior useful effect given by American engines. In the first place, American engineers generally take the car friction at five pounds, and the engine friction at ten pounds per ton, irrespective of atmospheric resistances. These low figures, accepted, probably, more by long experience than by any direct experiments upon train resistances—must be attributed chiefly to the employment of bogie rolling stock, central buffers and loose couplings, and oil-tight axle-boxes, which latter are always lined with an excellent bearing alloy. I have had some conversation on the subject of locomotive performances with one of the leading railway engineers in the States, and although the theories then advanced may not universally be accepted as infallible, yet they carry such weight with them that it will be well to enumerate them here. These points, which are independent of train resistances, refer essentially to the great steaming power of the American locomotive boilers, and to the manner in which these boilers are being worked and fed. The quick steam generation is mainly due to three causes, viz: the intensity of the fire, the thinness of the plates composing the fire-box, and the extremely forced draught. By these means a boiler of moderate proportions and heating surface is worked up—though at a more rapid rate of combustion—to an extent never attempted abroad.

The injector has been condemned by the Americans as being an expensive boiler feeder. Counter-pressure steam-brakes are equally unpopular out here, but each swivelling truck under the train, with the exception of the leading engine bogie, is always furnished with a hand-brake.

Great activity prevails in American railway matters, and all the locomotive works are consequently very busy. I understand that Messrs. Baldwin, of Philadelphia, have turned out not less than two hundred locomotives during the last twelve months. Locomotive building on this continent must, indeed, have made great progress of late, as verified by the perfect organization of the work-shops and the systematical manner in which the work is turned out. In general, my visit to this great country has made a lively impression on me, which, I am sure, will be shared by most impartial critics, that in the specialty of locomotive construction the Americans are fully equal, if not ahead, of the best European practice.

—A gigantic scheme for vesting the ownership of the principal railways of Massachusetts in the State has been devised by Mr. Edward S. Crane, and a pamphlet written by him on the subject has been printed by the Massachusetts Legislature. He proposes that six corporations be created, to be called respectively the Boston & New York Railway Trust Company, the Boston & Albany Railway Trust Company, the Northern Railway Trust Company, the Boston & Portland Railway Trust Company, and the Boston Railway Clearing & Depot Company, with capitals amounting in the aggregate to over $200,000,000. These corporations are to be authorized to purchase the stock and bonds of all the leading lines of railway communication which now center in Boston, at certain prices mentioned. On the $200,000,000 stock the State is to guarantee dividends at the rate of seven per cent. per annum for twenty years, and at the end of that period to buy the outstanding stock at par, any surplus over seven per cent. earned in the meanwhile to go to the State, and to be invested in the purchase of the stock, so that at the end of twenty years the State will in effect be the sole owner of all the railways. From thenceforth the rates of freight and passage are to be fixed at just enough to cover expenses.

—Judge Benjamin R. Curtis, of Boston, and William M. Evarts have united in an opinion that the Minnesota State railroad bonds are valid obligations upon the State, and that the Legislature of Minnesota is required to levy taxes to meet the interest and preserve the State credit.

General Railroad News.

OLD AND NEW ROADS.

Brunswick & Albany.

The company are now laying track on the section embracing the 120th mile post, from Brunswick, Ga., and expect to reach Albany in August next. The point of crossing the Flint River is not yet located.

The Bergen Tunnel.

The Bergen Tunnel difficulty has at length been amicably settled. At a meeting on the 18th ult., at which the Delaware, Lackawanna & Western Railroad was represented by Moses Taylor, Samuel Sloan and Job Bruhin, and the Erie by Jay Gould, definite settlement was arrived at on the following basis:

1. The use of Bergen Tunnel in common by both companies for ten years, the Erie to receive a rental for use of tunnel of $100,000 per annum, said rent to be paid by the two companies in proportion to their tonnage.

2. The business of Binghamton and Syracuse, to and from New York, to be divided equally between the Erie Company and the Delaware, Lackawanna & Western, the whole to be worked as a common line from New York to Syracuse and Oswego.

Des Moines to St. Louis.

It is proposed to extend the new Indianola & Des Moines Railroad from Indianola southeastward through Lacona, in the southeast corner of Warren County, and Russell, on the Burlington & Missouri River Railroad, to Moravia, on the Central of Iowa, about fifteen miles north of Moulton, near the Missouri line on the North Missouri road. This would open a very direct line from Des Moines to St. Louis. It would be about sixty miles long.

Iowa Central.

A company was formed in Oskaloosa, Iowa, last week, to build a road from that point, over the old Iowa Central grade, *via* Toledo and Cedar Falls, to Winona. F. W. H. Schofield, of the construction company that built the Central of Iowa, was elected President.

Hannibal & St. Joseph.

The Land Department of this company has issued a circular, which shows the population of each of the twenty counties of Missouri in which it owned lands in 1860 and 1870, with the per centage of increase, and the taxable wealth in 1866 and 1870. The totals for the twenty counties are as follows: Population in 1860, 224,863; in 1870, 325,014; increase, 100,151; percentage of increase, 44; taxable wealth in 1866, $60,424,719; in 1870, $91,591,680; increase, $31,166,961; percentage of increase, 52. So it seems that the property of the people has increased 52 per cent. in four years, while the population increased 44 per cent. in ten years. The company has remaining 125,385 acres of land in these counties, which it offers for sale to actual settlers. A large part of these lands (49,230 acres) is in Macon County.

Grand Rapids & Saginaw.

A company of this name has been organized at Grand Rapids, Mich., for building a road between the places mentioned in its title. W. D. Foster is President; A. X. Cary, Treasurer; and Eben Smith, Secretary.

Wheeling & Toledo.

The Wheeling & Toledo Railroad Company has been organized under the Ohio law. The termini of the road are to be Bridgeport, Belmont County, and Toledo, passing through Belmont, Harrison, Tuscarawas, Holmes, Wayne, Ashland, Richland, Crawford, Huron, Seneca, Sandusky, Ottawa, Wood and Lucas counties. The capital stock is $100,000.

Indianapolis, Cincinnati & Lafayette.

The receivers of this road have reported terms of compromise entered into between themselves and the Whitewater Valley Company, looking to a cancellation of the lease of the latter road now held by the former. The agreement in substance is that the Indianapolis, Cincinnati & Lafayette Company shall convey all its rights, title and interest in the Whitewater Valley road to the same, agreeing to operate it, however, until May 1, 1871, at which time the road and all equipments will be turned over to the Whitewater Valley Company, as well as the net profits that may accrue.

Oregon & California.

This railroad is now in operation from Portland southward to Albany, Oregon, eighty-two miles. The stations and distances are as follows:

Portland	0	Aurora	35
East Portland	2	Gervais	48
Milwaukee	6	Salem	56
Marshfield	11	Turner	62
Oregon City	15	Marion	67
Rock Island	20	Jefferson	76
Canby	24	Albany	82

Denver & Rio Grande.

A correspondent of the St. Louis *Republican* gives the following description of this projected narrow-gauge railroad, the construction of which is actually begun:

"It is understood that Gen. W. S. Palmer, late Manager of Construction on the Kansas Pacific, R. B. Lamborn, Esq., Treasurer Pennsylvania Steel Company, Philadelphia, and A. C. Hunt, Esq., ex-Governor of Colorado, are supporting and piloting the movement. A Long Island millionaire is said to have a hand in the pie. It is assumed that a narrow-gauge road is just the remedy for all our commercial ills. Ergo, the narrow-gauge principle will be adopted. The line as now projected will touch at Colorado City, Pueblo, Canon City, Albuquerque, and terminate at El Paso. It is about 850 miles from Denver to El Paso. Between Denver and the Divide, fifty miles south, it will be necessary to overcome an obstruction of 2,000 feet, and the steepest grade on this section of the road will be 75 feet to the mile. The Divide, as we are wont to term it, is no more than a strip of "table land," extending out upon the plain from the base of the Rocky Mountains, and separating the Platte and Arkansas valleys. From the summit of this Divide south to Colorado City, at the foot of Pike's Peak, the engineers will have to grapple with a great many curves of very short radius. The road can be built at small cost comparatively between Colorado City and Canon City. Thence the road enters the mountains, following up the Arkansas through the Big Canon, a narrow gorge ten miles in length, with walls of stupendous height. The line will cross the Snowy Range through Poncho Pass, thence down the Rio Grande through San Luis Park, Gilpin's promissory paradise, and leaving Santa Fe to the west ward, touching at Albuquerque, as already stated, and connecting with the Southern Pacific at El Paso. San Luis Park, recently purchased by an English company, embraces a variety of resources, and is capable of supporting an immense population.

Stillwater & St. Paul.

A suit was commenced in the District Court at St. Paul on the 25th ult. against Governor Austin and the Stillwater & St. Paul Railroad Company, to restrain the Governor from executing, and the company from receiving, a deed of lands inuring to the company. Judge Wilkin granted an order requiring the Governor and company to show cause why injunction should not issue. This suit is concerning the excess of lands granted for building a railroad to Stillwater, only a portion of which has been earned, it is claimed, in consequence of the road being built from White Bear Lake, a station on the Lake Superior Railroad, instead of from St. Paul, and the parties who bring suit desire to have the excess of lands used in building a railroad to Stillwater direct from St. Paul, and to connect with the West Wisconsin Railway. The Railroad Committee of the House has reported a bill transferring these lands to the latter road after it shall have been completed to Stillwater. This matter has given rise to one of the principal fights of this session of the Minnesota Legislature, the Lake Superior Railroad Company claiming the entire grant.

Washington & Oskaloosa.

Some time ago a proposition was made to extend the Washington Branch of the Chicago, Rock Island & Pacific Railroad from Washington westward in the direction of Oskaloosa as far at least as Sigourney, 27 miles. All the subscriptions asked for have been made, and it is expected that it will be constructed soon. The distance from Sigourney to Oskaloosa is about 25 miles.

Cedar Rapids & St. Louis.

A company has been organized by this name to do the work abandoned by the St. Louis & Cedar Rapids Company, which constructed the line in Iowa operated by the North Missouri as far north as Ottumwa, and there stopped, leaving a road-bed nearly completed from Ottumwa northeast to Sigourney, 26 miles. Ottumwa has voted a tax of about $40,000 to extend the line to Cedar Rapids, Cedar Rapids has done the same, and two routes are surveyed, one by way of Marengo and one by Homestead.

Chicago & Iowa.

It is reported that the engineers of this company have made a preliminary survey of a line from Oregon northwestward, crossing the Western Union about twelve miles southwest of Freeport, into the township of Stockton, Jo Daviess County, nine miles south of Warren, apparently on the way to Bellevue. Such a line would divide pretty evenly the territory between the Western Union and the Illinois Central west of Freeport. This would form a pretty direct line to Dubuque, and give accommodations for local traffic quite as good, perhaps, as any that could be constructed.

Canadian Pacific.

The Canadian correspondent of an exchange says: "Last year a special committee of the Senate, when considering so limited a project as a 36-inch road to Manitoba, recorded their conviction that the survey or even the discussion of the question must be for many years premature. Yet here we are, going to build the road on an hour's notice. The intention is evidently to go before the country on the Pacific railway platform. If executed in good faith no enterprise could be more patriotic or profitable. The Canada Pacific running from Bute Inlet to Halifax would be a serious blow to the American Pacific lines, notably to the Northern. The line from its northern latitude is much shorter, so also are the ocean passages from China or Japan to Bute Inlet, and from Halifax to Liverpool. Bute Inlet is one of the finest ports on the Pacific coast. The Yellow Head Pass is far easier than that through which the Northern line must climb. Then the Canadian route traverses the fertile valley of the Saskatchewan, the great "fertile belt," with its easy grades, while the Northern runs through the sterile desert, which can never hope to support population or furnish way freight. The Canada Pacific would act as an outlet for all this population, which is exactly what the Northern Pacific was intended to be."

Washington & Richmond.

It seems that the incorporation of this company, which is to construct a line for the Pennsylvania Railroad, was not finally defeated in the Virginia Senate, but the bill was modified by amendments, and in that form passed both houses.

Iowa Southern.

This company, which intends to construct a railroad from Alexandria, Mo., (on the Mississippi at the mouth of the Des Moines, just opposite Warsaw, Ill., and about five miles below Keokuk) west by north to the southern tier of counties in Iowa and due west through them to the Missouri River, has let contracts for 300,000 ties and received several car loads of iron.

Chicago, Dubuque & Minnesota.

The line of this road is located, and partly graded, from Dubuque northward to the dividing line of Clayton and Allamakee counties, a few miles north of McGregor. Mr. L. Stanton is now making the preliminary surveys from there northward.

West Wisconsin.

It is reported that arrangements have been completed between this company and the Lake Superior & Mississippi Company by which the former will construct its line so as to cross the St. Croix River and enter Minnesota at Stillwater instead of Hudson, the former place being about seven miles north of the latter. Thence the Stillwater & White-Bear Branch of the Lake Superior & Mississippi road and its main line south of White Bear will afford a connection with St. Paul saving the construction of about 18 miles of road. In this way, too, a very direct connection with Duluth and the Northern Pacific Railroad will be secured. The route to St. Paul would be several miles longer than by way of Hudson.

Northern of Canada.

This railroad extends from Toronto to Collingwood, 94 miles. The report of the directors for the year 1870 gives the following:

The gross traffic receipts for the year have been $733,567.52, as against $671,076.51 in 1869, showing an increase of 10.73 per cent.

The ordinary working expenses of the year have been $426,118.61, as against $338,035.91 in 1869, being, for year 1870, a rate on gross traffic receipts of 58.08 per cent. To these sums have to be added $136,248.03 for extensions and additions to works, buildings, and equipment.

The balance for the year carried to the net revenue account has amounted to $171,200.88, which, after appropriations to meet all accruing interest dividends, leaves a balance of $9,135.31 to be carried forward to the credit of 1871.

The expenditure on capital account during the year had amounted to $198,560, appropriated to the construction of elevators at Toronto and Collingwood, and to the extension of the rolling stock equipment. The whole amount of Third Preference A Debentures issued to this date is $198,560, leaving a balance of $44,773.33 to complete the issue authorized by the act of 1868.

Des Moines, Winterset & Southwestern.

All the towns in Madison County, Iowa, which were called on by the stipulation with B. F. Allen to vote a 5 per cent. tax in aid of this railroad have done so, and the construction of that road is now considered certain.

Springfield & Illinois Southeastern.

The company has been for some time operating successfully the south division of the line, from Edgewood to Shawneetown, 96 miles, which gives Chicago access to a country heretofore almost entirely isolated from it and trading chiefly with Cincinnati. The company has recently made a contract with a steamboat com-

pany for the transportation of its traffic down the Ohio and Mississippi. The northern division, which has been in operation a year from Pana to Springfield, has been extended northwestward about six miles beyond Ashland, will soon reach Virginia, and by the 1st of June is to be completed to Beardstown, on the Illinois River, where it will meet the the Rockford, Rock Island & St. Louis road. This division then will be 90 miles long; at present it is about 65 miles. The traffic so far has been quite satisfactory.

A Railroad in China.

The first railroad in China, which is merely a track three miles long around an arsenal at Tien-Tsin, was lately completed.

Marquette & Ontonagon.

A party of engineers is to commence a survey this month for the location of an extension of this road from Lake Michigammi northwestward to l'Anse Bay.

Columbus, Chicago & Indiana Central.

An arrangement has been made with the Pennsylvania company by which the above named company becomes free from floating debt. The following paper signed by the Presidents of the Pennsylvania and the Pittsburgh, Cincinnati & St. Louis companies, and addressed to W. R. Fosdick and James A. Roosevelt, Trustees, and A. Parkhurst, Trustee, reaffirms the guarantee of the interest of the first and second mortgage bonds of the Columbus company:

"Under the contract and lease of the Columbus, Chicago & Indiana Central Railway, dated January 22, 1869, as amended by the contract of February 1, 1870, the Pittsburgh, Cincinnati & St. Louis Railway Company as lessee, which lease the Pennsylvania Railroad Company has guaranteed, will, by the terms of the said lease, pay the interest as it matures on the $15,000,000 of the first mortgage consolidated bonds of the Columbus, Chicago & Indiana Central Railway Company, or on the bonds which they represent; and on $821,000 of the second mortgage bonds of the Columbus, Chicago & Indiana Central Railway Company, which bonds are secured by deeds of trust made respectively to you. You are therefore authorized to inform the holders of said bonds, and to give such further public notice as you may think proper, that the interest on the said $15,821,000 of bonds will be regularly paid by the Pittsburgh, Cincinnati & St. Louis Railway Company, or the Pennsylvania Railroad Company, according to the tenor of said amended contract."

Topeka to Lincoln.

A company has been organized at Topeka, Kansas, for building a road from there to Lincoln, Nebraska, *via* Netawaka, Capiona and Sebetha. Judge Safford was elected President; Charles Sprague, Vice-President; John Guthrie, of Topeka, Secretary, and T. B. Collins, Treasurer.

Evansville, Henderson & Nashville.

The last rail was laid on this line a few days ago, and the line is now completed from Henderson, on the Ohio River, to Nashville. This in connection with the Chicago, Danville & Vincennes and the Evansville & Crawfordsville roads will form the shortest route between Chicago and Nashville, and is likely soon to have close connections with St. Louis also.

Illinois Grand Trunk.

This railroad, which has been constructed within a few months for the Chicago, Burlington & Quincy Railroad Company, is now nearly completed from Mendota to Prophetstown, 45 miles; the small part at the western end yet unfinished will doubtless be completed before the end of next week. From the company's map (executed with remarkable accuracy and elegance by Assistant Engineer Ch. J. Quetil) we learn that the stations and distances are as follows:

	Miles.		Miles.
Mendota	0	Deer Grove	31¾
Lamoille	8¾	Tampico	37
Albright	19	Prophetstown	45
Walnut	25½		

The road keeps along the line of the Burlington road from the depot in Mendota to the western edge of the town, thence a little south of west to Lamoille, whence its course is west by north, Prophetstown being about eight miles further north than Mendota.

Northern Vermont & Lake Champlain.

At a meeting of the commissioners of the company, held lately at Burlington, Vermont, an estimate was presented, made by Mr. Hale, one of the constructing engineers of the Vermont Central, which placed the cost of constructing the twenty miles of track from Essex Junction to where it can join the Lamoille Valley road in Cambridge, at $20,000 a mile, including bridges, ties, rails and everything complete for the cars, but not including land damages.

Cincinnati and the Southwest.

One Southern railroad will not finish our enterprises or satisfy our needs. We must have complete connections with the whole Southwest if we would have our city sustain its position. With these, no interior city will have a better promise for the future. The course of Louisville toward our Southern road is that of a dog-in-the-manger. It is not because it will take trade which she has, but because it will develop trade which will not be hers. But the line to Nashville and Memphis by the Rockport route will be a much stronger rival to Louisville than the road to Chattanooga. It runs through as rich a country as the Louisville & Nashville road. It runs between Louisville and Western Kentucky, cutting off the trade of all the wide country west of its line, and intercepting all the railroads west and south of it. It will also secure the trade of a rich country in Indiana now subject to diverting influences. It will force the existing railroads from Cincinnati to Louisville and Nashville to make the same terms and conditions for through freight and passengers, thus developing that into as good a Cincinnati line as it is possible to have. And the subscriptions which are asked of our citizens are to the stock, which the out-and-out gifts along the line will make valuable, for the road will at once secure a profitable business.—*Cincinnati Gazette.*

Union Pacific.

Last Tuesday the Senate adopted by a vote of 38 to 19 Mr. Stewart's amendment to the appropriation bill. This directs the Secretary of the Treasury to retain one-half of the amounts due the Pacific railroads for government transportation to apply to the payment of the interest of the bonds of the railroads guaranteed by the government. This is in accordance with the opinion of the Judiciary Committee.

Cincinnati Southern.

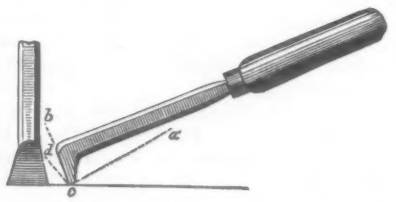
The bill granting a charter for this company to construct a railroad across the State of Kentucky passed the National House of Representatives last Tuesday. The Kentucky Legislature had refused to charter it. The vote was 131 to 62—nearly all the Democrats voting against it. It will probably pass the Senate if a vote can be reached.

MECHANICS AND ENGINEERING.

Scraping Slide-Valve Face.

The following is from a correspondent of the *English Mechanic*:

"Scraping surfaces is an art that is hardly to be learnt from description, and is very difficult, at least to beginners, to do well. Every fitter practises it, and the best way to learn is to watch a fitter at work, and, if you can, get a hint or two from him. The kind of tool I prefer is a three-square file, ground smooth on the sides and the edges, which are not much altered from the form of the file itself, kept sharp by the oil-stone, which requires using constantly. At Woolwich Arsenal the favorite sort seems to be a 5 in. or 6 in. superfine Lancashire flat file, ground smooth on both sides, and quite square and flat on the end, so as to give a straight-cutting edge, and used slanting downwards, and pushed away from you in use in about the same position as in sharpening a carpenters chisel on a stone. The one that I am told is in use at Whitworth's is made of a ½ in. square bar of



steel, drawn a trifle smaller, and the arrises worked down octagon, and the end spread out and turned square down like a garden-hoe about ⅝ in. wide and 1-16 in. thick. It is gound quite flat on the end *b c*, and also on what, in a hoe, is the cutting edge, in the direction *c a*, and I think is usually touched on the oil-stone, so as to leave a small facet in the direction of the dotted line *d c*. The action is the same, and the edge comes in the same position, both to the work and to the operator, as the Woolwich tool. I have never been very successful in the use of this sort, having always found great difficulty in keeping an edge on it, but it certainly does work well while the edge lasts. You require a true surface plate to prove your work on by rubbing with a trifling quantity of red chalk and oil smeared on the surface plate, to show the high places of the work, which have to be scraped off, taking great care not to scrape a hole where there was a hill, and a good straight edge should now and then be applied to see that your work is not *winding*, which is not always very easy to detect by the use of the surface plate alone. I find the spirit level best for testing a long lathe bed in that respect, as you can by its means discover a much smaller error than the thickness of this printed sheet in a 10 ft. bed, a quantity that would escape notice under the test of winding strips, except in the most favorable light, which is seldom to be got. If you can get Holtzapffel's Vol. 2 you will find excellent instructions at p. 865, and the following pages on the Production of Flat Surfaces by Filing and Scraping."

Bridge over the Wabash.

The St. Louis & Southeastern Railway Company are now driving the piles for a bridge over the Wabash River, ten miles west of Mt. Vernon, Indiana. It will be 1,100 feet long, in three spans of 180 ft., two of 160 ft., and a draw of two spans, each 120 ft. The truss, on the Howe plan, now building in Toledo, will be 26 feet deep, and is nearly a continuous girder, broken only by the draw, as each span is secured to the next by braced corbels. Mr. Andrews, a contractor on the St. Louis Bridge, will build the masonry on floating platforms and sink them on the piles, cut below low water mark.

Tombigbee River Bridge.

The supervisors of Monroe County, Miss., advertise for proposals for the superstructure of a 300 feet roadway draw-bridge over the Tombigbee River, at Aberdeen, Miss. Proposals will be received by W. H. Clopton, Aberdeen, Miss., up to the 2d of April next.

Damage to Buildings by Underground Railroads.

The Pall Mall *Gazette*, of February 6, says: "There can be no doubt that the underground railways are very convenient to those who have occasion to travel by them, but passengers, as they are whisked through the tunnel, and vacantly gaze through the window panes of the carriages at the apparently endless miles of brickwork through which they are passing, give no thought to the sufferings of those dwelling above their heads; yet it is to be feared that no trains ever run over the rails without jarring the nerves and wounding the susceptibilities of somebody or other. Some little light is thrown on this subject by the groans uttered at a meeting held a few days ago at the Blind School, Upper Avon road, St. John's Wood, to take steps for opposing the Metropolitan & St. John's Wood Railway (extension) bill, so far as it refers to the proposal to run heavy goods trains in conjunction with the Midland Railway along the line.

"Dr. Musgrave, who occupied the chair, stated that 'his house was so jolted by the present passenger 'traffic that there was not a single article of furniture 'which was not rattled about. It was quite certain 'that if the Midland Railway had the power conferred 'upon them to run goods trains over this line of rail-'way there would be no peace day or night. He could 'only foresee that most of the houses, if that traffic 'were carried over the line, must fall down.' Dr. Musgrave's troubles, however, are not comparable, for intensity, with those of 'a resident in the Finchley New 'road,' who said that 'the mere shifting of the empty 'trains from one line to another, near his house, had 'caused it, to a certain extent, to give way—the back of 'his house evidently so. Between his breakfast-room 'and the pantry a hand could be put right through, and 'seen in the opposite room. Other parts of the house 'were constantly dropping from the vibrations, and it 'was in such a bad condition that if a dog ran across 'his dining-room, the spoons or forks chattered on the 'plates or dishes on which they might be lying.' He further added that he had been informed by a surveyor that his house was in a very dangerous condition, and if he (the speaker) let anything drop heavily, he might have 'the back front' of the house come down."

Galvanic Engines.

Much has been said of late of the probable application of electricity as a motive power, on account of certain experiments made by Rev. Mr. Highton in England. Concerning this subject, Prof. Hervey Morton, of the Stevens Institute of Technology, writes as follows to the New York *Times:*

"The doctrine of conservation of force (now as well established as that of gravitation) teaches us that a certain maximum of force can be developed by the use of a given quantity of any material—as, for example, coal in a steam engine, or zinc in a galvanic battery—which may be more or less completely utilized, but cannot be exceeded. Thus, a pound of coal burned in one minute, if applied without any loss what ver, would develop 332-horse power for that time; as applied in practice, in our ordinary engines, it develops but about 12-horse power, all the rest being lost. We see here what a margin for improvement exists. We are getting but from three to five per cent. of the "good" out of our fuel, and we might suppose that some other way of developing force, if less wasteful, might be economical, even if a more costly material than coal were consumed.

"All galvanic engines derive their power from the

zinc consumed in the battery. Now, a pound of zinc consumed under the most favorable conditions (*i. e.*, without any loss of effect whatever,) could yield thirty-five horse power for one minute, or say about one-horse power for an hour, if applied to a machine in which there was no loss of effect.

An absolutely perfect galvanic engine, actuated by a perfect battery, could, then, at the best, develop but one-horse power per hour from each pound of zinc consumed in that time (strictly, .917 of a horse power.) Or, to develop two and a half horse power for ten hours would demand the consumption of about twenty-seven pounds of zinc, and this, be it remembered, without allowance for any loss in the battery, which we know to be very great, or in the galvanic engine, which we may be sure is something. A common steam-engine would require for the same work about 125 pounds of coal, or about four times the weight, but then coal is between fifty and sixty times cheaper than zinc. The weak point of the galvanic motor is then not only the high cost of zinc, but the low efficiency of that material, being but about one-sixth that of coal, weight for weight."

ELECTIONS AND APPOINTMENTS.

—On the 21st ult. the Delaware, Lackawanna & Western Railway Company re-elected all its directors and officers. These are William E. Dodge, Moses Taylor, Rufus R. Graves, Lowell Holbrook, Simeon B. Chittendon, George Bliss, Percy R. Pyne, and William Walter Phelps, of New York; George Bulkley, Southport, Conn.; John I. Blair, Blairstown, N. J.; John Brisbin, Newark, N. J.; Joseph H. Scranton and James Blair, Scranton, Penn.; and John C. Phelps, Wilkesbarre, Penn.

—Under the provisions of the law of the State authorizing the appointment of directors of certain railroads in the State, Governor Palmer, of Illinois, has appointed Joseph J. Castles and Daniel Hay, Directors of the St. Louis & Southeastern Railway, and in the place of A. J. Cloud appointed David W. Lusk to the same position.

—The annual meeting of the Maine Central Railroad Company was held on the 22d inst., and the following directors were elected: R. D. Rice, of Augusta; John B. Brown, of Portland; Darius Alden, of Augusta; George M. Patten, of Bath; Horatio N. Jose, of Portland, representing the old Portland & Kennebec Company; Ex-Governor Anson P. Morrill, of Readfield; Amos D. Lockwood, of Lewiston; Reuben B. Dunn, of Waterville; George L. Ward, of Boston, representing the Maine Central corporation; Ex-Governor Aben Coburn, of Skowhegan, representing the old Somerset & Kennebec organizations. The Hon. R. D. Rice, of Augusta, was elected President and Josiah H. Drummond, Clerk.

—A portion of the stockholders and directors of the St. Louis & Southeastern Company, and the Evansville & Southern Illinois Railroad Company, met at the office of the former, and by an unanimous vote both companies were consolidated, the combined capital stock of which is nine and a half million of dollars. After the consolidation the following board of directors were elected: Edward F. Winslow, St. Louis; Jediah F. Alexander, Greenville, Ill.; Joseph J. Castles, Equality, Ill.; John Lee, St. Louis; H. W. Gardiner, Mt. Vernon, Ill.; Charles W. Thomas, Belleville, Ill.; C. W. Gardiner, St. Louis; Aaron G. Cloud, McLeansboro', Ill.; Edward P. Rice, St. Louis; Bluford Wilson, Shawneetown, Ill. A meeting of the directors was held, and the following officers elected: President, Edward F. Winslow; First Vice-President, Joseph J. Castles; Second Vice-President, Jas. H. Wilson; Third Vice-President, J. F. Alexander; Secretary and Treasurer, Chas. W. Gardiner; Attorney, R. W. Townshend; Auditor, John P. Hains.

—Gen. W. Gleason has been appointed Chief Engineer of the Mansfield, Coldwater & Lake Michigan Railroad, and will immediately commence a survey of the line between Mansfield and Tiffin.

—The election of directors of the Cleveland, Columbus, Cincinnati & Indianapolis Railroad Company took place in Cleveland on the 1st. The old board was re-elected, with two exceptions. Horace F. Clark and Augustus Schell, of New York, were elected in place of J. H. Wade and Stillman Witt, of Cleveland. Oscar Townsend was re-elected President, and the other officers of the road will be the same as last year.

—Mr. A. Mitchell has been appointed Assistant General Superintendent of the Illinois Central Railroad, with office in Chicago, and all communications pertaining to the Superintendent's department should be addressed to him. Mr. Mitchell has been, for several years past, Superintendent of the Chicago Division of this road, and previously a division engineer in its service.

—Mr. C. A. Beck, late station agent of the Illinois Central Railroad at Dubuque, has been appointed Superintendent of the Chicago Division, with office at Centralia, succeeding A. Mitchell, promoted.

—A. H. Perry, Superintendent of the Connecticut & Passumpsic Rivers Railroad, has resigned that office and accepted an appointment as General Superintendent of the Chesapeake & Ohio Railroad, with headquarters at Richmond, Va.

LOCOMOTIVE STATISTICS.

Pittsburgh, Fort Wayne & Chicago.

Mr. S. M. Cummings, Master Mechanic of the Eastern Division, makes the following report for the division for the year 1870:

The number of miles run was, on

Passenger trains	796,365
Freight trains	2,085,748
Wood trains	6,130
Ballast trains	83,497
Total	2,971,740

The cost per mile run was for

Repairs	5.47 cts.
Fuel	5.60 "
Stores	1.29 "
Engineers, firemen and wipers	7.02 "
Other accounts not included in above	1.00 "
Total cost per mile run	20.38 cts.
Miles run to pint of oil	43.12
" " ton of coal	15.53

Three hundred and forty-four locomotives are employed on the division, ten new locomotives have gone into service during the year, and one new locomotive is building.

Illinois Central.

The report of S. J. Hayes, Superintendent of Machinery of the Illinois Central Railroad, for the month of December, 1870, affords the following:

Passenger trains	122,375
Freight	306,896
Construction, etc	934
Switching	57,211
Total	487,416

The cost per mile run was:

For oil and waste	0.76 cts.
For fuel	7.68 "
For engineers and firemen	5.89 "
For cleaning	1.04 "
For repairs	7.68 "
Total	23.05 cts.

Cost per mile run, in cents:

Passenger engines	15.44 cts.
Freight engines	26 00 "
Construction engines	24.08 "
Switching engines	15.13 "

Average number of miles run to

Pint of oil	14.49
Ton of coal	33.28

One hundred and seventy-four locomotives made mileage during the month. This report is for 974 miles operated. One locomotive has had general repairs, and eleven are undergoing general, or thorough, repairs.

Michigan Central.

The following is the report of the report of locomotive performance for the month of January, 1871:

Number of cars drawn one mile	2 796,066
Equal to cars drawn over entire line	9,845
Number of cars drawn one mile in December, 1870	2,925,149
Equal to cars drawn over entire line in "	10,300
Number of miles run to 1 pint of oil	11.82
" " " 1 cord of wood	31.90
" " " 1 pint of oil in December, 1870	12.52
" " " 1 cord of wood " "	29.78
" " " 1 ton of coal	33.09
" " " 1 ton of coal in December, 1870	32.95
Average size of trains	cars 20.33
Average size of trains in December, 1870	" 20.28
Number of gallons of oil used	3,161¾
Number of cords of wood used	6,596
Number of tons of coal used	2,841
Number of miles run by passenger trains	76,548
" " " freight trains	163,712
" " " miscellaneous trains	16,926
" " " training engines	42,007
Total	299,193

TRAFFIC AND EARNINGS.

—The St. Louis barge line bills freight to Mobile, transferring at New Orleans to the Morgan line of steamers. And as the competition at New Orleans is quite strong for Mobile business, the steamer company agrees to deduct from rate at which goods are billed at St. Louis, the amount of the "cut" at the time between New Orleans and Mobile.

—An arrangement has been made between the St. Louis and Vicksburg Packet Line and railroads having connections with Vicksburg, by which through bills of lading will be given to all points in Alabama, Georgia, South Carolina and Florida. The line will be known as the St. Louis, Vicksburg & Savannah Fast Freight Express.

—The receipts of the United Companies of New Jersey from passengers, mails, expresses, etc., for 1870 were $7,260.240.78; expenses of operating canals and roads during the same period, $4,549,185.60; balance $9,711,955.18; interest, general expenses, taxes, sinking fund, etc., $1,486,488.30; net earnings, $1,224,566.88.

Chicago Railroad News.

Lake Shore & Michigan Southern.

The following figures are from the report made by the company to the State Engineer and Surveyor, of New York, for the year ended September 30, 1870:

Capital stock by charter	$50,000,000
" " paid in	34,938,000
Funded debt, 7 per cent	22,001,000
Floating debt	1,573,314
Total stock, bonds and debt existing Sept. 30, 1870	$58,512,314
Cost of road, branches and equipments	57,804,745
Length of road and laterals, miles	942.25
" double track, sidings, etc "	95.45
" branches owned "	118.83
" main line (Buffalo to Chicago) "	539.97
Weight of iron on main tracks, lbs. per yard	60
Engine houses and shops	20
Locomotive engines	276
Passenger cars, 1st class (8-wheel)	134
" " 2d class (8 wheel)	40
Baggage, mail and express cars (8-wheel)	57
Freight cars (8-wheel)	5,942
Miles run by passenger trains	2,232,132
" " freight trains	4,362,758
" " other trains	977,611
" " passenger, freight, etc., trains (all)	7,572,501
Passengers carried (all classes)	2,424,896
" " one mile	197,775,480
Freight (tons of 2,000 lbs.) carried	2,843,084
Freight (tons of 2,000 lbs.) carried one mile	521,149,505
Expenses—Maintenance of way	$2,945,131
" Repairs of machinery, etc	1,157,336
" Operating and general	4,186,466
" On all the above accounts	8,288,934
Earnings—From passengers	4,245,298
" From freights	8,306,254
" From other sources	620,682
" From all the above sources	13,171,234
Net earnings from operations	4,882,299
Interest paid on funded debt	$1,708,777
Dividends paid (on common stock 8, and on guaranteed 10 per cent)	2,905,571
Carried to surplus fund	267,958
Total amount of surplus fund	1,230,716

The company had no road in New York the year previous, except during the single month of September, and the return for that year covers only the Buffalo & Erie Railroad; therefore no comparisons are possible.

Illinois Central.

The following order, dated February 24, has been issued by Vice-President Newell:

"Mr. A. Mitchell has been appointed Assistant General Superintendent of this company's road, with office at Chicago.

"All communications pertaining to the Superintendent's department will be addressed to him.

"Mr. C. A. Beck has been appointed Superintendent of the Chicago Division, with office at Centralia."

Mr. Mitchell, we understand, will have general charge of the operation of the company's roads.

Chicago City Railway.

This company is about to increase, materially, its accommodations for the largest part of its patrons, by running cars as far as Thirty-first street, on the Cottage Grove avenue line, every two minutes in the morning and evening, and every four minutes during the rest of the day, which is twice as often as at present. Then 27 cars will leave the Randolph street terminus every 24 minutes, viz.: one every two minutes for the Cottage Grove avenue line, one every six minutes for the Indiana avenue line, one every three minutes for the State street line, and one every eight minutes for the Archer avenue line. Thus the cars will be 53⅓ seconds apart, and State street, north of Nineteenth, will be almost one continuous train. There hardly seems to be room to increase the number hereafter.

Chicago & Northwestern.

The following orders were issued this week in reference to the death of John B. Turner:

"CHICAGO & NORTHWESTERN RAILWAY,
OFFICE OF THE GENERAL MANAGER,
CHICAGO, Feb. 27, 1871.

"*Jno. C. Gault, General Superintendent:*

"DEAR SIR: John B. Turner, the first executive officer of the Galena & Chicago Union Railroad Company, for seven years an honored member of the Board of Directors of this company, a judicious and faithful counsellor, a genial companion, a considerate friend, and a Christian gentleman, is dead.

"His devotion to the material interests of his country was excelled only by the patriotism which never lost sight of the highest duties of citizenship.

"His great works live after him, and will keep his memory green forever. It is proper that we who have labored with him living, should honor him dead.

"In profound respect for his memory, I request that you direct the general offices and shops in Chicago to be closed on Wednesday next, from 9:30 a. m. until 1 p. m., that all who desire may have an opportunity to attend his funeral. Yours respectfully, GEO. L. DUNLAP, Gen. Man."

"OFFICE OF THE GENERAL SUPERINTENDENT,
CHICAGO, Feb. 27, 1871.

"In accordance with the above announcement of the General Manager, notice is hereby given that all the Chicago shops of the company, and the general offices, will be closed on Wednesday, from 9:30 o'clock a. m. to 1 o'clock p. m.

"JNO. C. GAULT,
"General Superintendent."

Chicago & Alton.

This company has taken a perpetual lease of the Louisiana & Roadhouse Branch, which has been constructed in the name of the St Louis, Jacksonville & Chicago Railroad Company, whose main line forms the Jacksonville Division of the Chicago & Alton road.

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

CONTENTS.

	Page.
ILLUSTRATIONS.	
Allen's Double Bogie Locomotive	529
Indicator Diagrams	533
Scraping Tool	536
CONTRIBUTIONS.	
Action of Cold on Iron and Steel, by Wm. S. Huntington	530
Comments on Sundry Railroad Topics	531
Education of Locomotive Engineers and Machinists	531
Creamer Brake and the New Hamburg Accident	532
"Protection for Civil Engineers."	532
SELECTIONS.	
Narrow-Gauge Railroads	530
Cheap Boiler Plates	530
Action of Steam in Locomotive Cylinders	532
Vermont Central and Northern Transportation Company	533
SELECTIONS.	
Dangerous Freight Cars	533
J. H. Simmons (poetry)	533
Boiler Explosions	533
American Locomotives	534
GENERAL RAILROAD NEWS.	
Old and New Roads	535
Mechanics and Engineering	536
Elections and Appointments	537
Locomotive Statistics	537
The Fuller Freight Bill	539
Pennsylvania R. R. Company—Report	540
Atchison & Nebraska	541
EDITORIALS.	
A Bit of History	529
The Pennsylvania Report	538
Paul Brothers' Letter	538
Examining and Licensing Engineers	538
John B. Turner	539
Short Cut to Lake Superior	539
CHICAGO RAILROAD NEWS	537

INDEX TO RAILROAD ADVERTISEMENTS.

	Page.		Page.
Leavenworth, Lawrence & Galveston	547	Illinois Central	549
Chicago, R. I. & Pacific	547	Chicago & Northwestern	549
Kansas Pacific	547	Milwaukee & St. Paul	549
Western Union	547	Pan-Handle	550
Chicago, Alton & St. Louis	548	Pennsylvania & Ft. Wayne	550
Hannibal & St. Joseph	548	Erie Railway	550
Chi. Burlington & Quincy	548	Kansas City, St. Joseph & Council Bluffs	550
North Missouri	548	Michigan Southern	551
Pacific of Missouri	548	Michigan Central	551

Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.*

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Engineering and Mechanics.—Mr. M. N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent.

Removal.—The office of the RAILROAD GAZETTE *is removed to Nos.* 110 *and* 112 *Madison Street.*

☞ *Our Prospectus and Business Notices will be found on the last page.*

PAUL BROTHERS' LETTER.

Messrs. Paul Brothers say, very truly, in their letter which we published last week, that "the main question "under discussion is involved in the weight of cars." In their next sentence they say, however, what is not so true, viz., that we "claim that on branch lines of "the ordinary gauge the weight of cars can be reduced "to the same proportion of dead to paying weight as is "now used on the narrow gauge." What we have maintained is, that the amount of dead to paying weight is *not in proportion to the distance between the rails*; on the contrary, we say that up to 5 ft. the gauge has a very slight influence on the proportion of dead to paying load. In view of this statement, we desire to make the following offer to Messrs. Paul Brothers: If they will say how much less a car will weigh to carry 4 tons of coal on a 3 ft. gauge than one of the same strength and capacity for a 4 ft. 8½ in. road, and will furnish us with a drawing and engraving of it, we will publish it, and will then furnish our readers with an illustration of a car for a wider gauge from which they can judge of the difference in the dead weight. We will only stipulate that the drawings—if not the engravings—of each car shall be sufficiently accurate and in detail that an intelligent draftsman can calculate the weight of each from the drawings. What we wish to maintain is, that the weight of the 4 ft. 8½ in. car will not exceed that for the 3 ft. gauge 15 per cent., if they are both of the same strength and capacity, and that the total weight of the wide-gauge car, including its load, will not be increased more than 6 per cent. Practically, this difference would be almost inappreciable in its effects upon the rails.

The weight of the cars is the main question at issue. If our 4 ft. 8½ in. cars can be nearly of the same weight as theirs, the rails need be very little if any heavier for a narrow than for a 4 ft. 8½ in. gauge, provided that the same class of rolling stock is used on each.

The same is true of bridges and all the other items of cost in which they claim so great a saving. The reason which is urged with so much persistance for building narrow-gauge roads is their cheapness, and the cause assigned for this decrease in cost is the lightness of their rolling stock. If, as we believe, rolling stock for a 4 ft. 8½ in. gauge road can be built of the same strength very nearly as light as for a 3 ft. gauge, then the argument in favor of the latter has no force. It does not matter whether we can run our light rolling stock among heavy cars or not. A light wide road is no worse off in that respect than a light narrow road. Although it might not be safe to send light cars "sandwiched" between heavy cars from Akron to Cleveland, yet what is there to prevent sending the cars without "sandwiching?" A patient once called to see the celebrated Dr. Abernethy and told him that when he raised his arm up so, he had the most violent pain in his left side. "What a fool you must be," replied the doctor, "to raise your arm up so." So if it would be unsafe to "sandwich" light cars, then it would be foolish to do it. If they cannot be sent between heavier cars, then send them in trains by themselves. We doubt, however, whether it would be desirable to attempt to do through business on any of the main lines in cars with a capacity so limited as would be required on light roads. There is, however, this important point in favor of the 4 ft. 8½ in. gauge: when cars from the branch are needed on the main line, or *vice versa*, they can be run there; whereas, under no circumstances could this be done on a 3 foot gauge.

The reason why a narrow-gauge might be preferable for a temporary road for excavating is that, 1st, the road and cars must all be portable; 2d, the space in which such a road must be laid is often limited, as in a coal mine; 3d, it is hardly ever desirable to use such a road for other cars, or other cars on such a road; 4th, the cars are moved extremely slowly, so that their stability is no consideration.

Our correspondent expresses some surprise that we should advocate light cars, because in a previous article we said that they must be made strong enough to bear the rough usage to which they are subjected. They and every one else must make them so sooner or later, whether the gauge is wide or narrow. Every pound's weight added to the cars which is not necessary to give the required strength is not only useless but a positive evil; but our correspondent must also remember that every pound *less* than is necessary will be fatal to their cars, if not to the passengers. If Messrs. Paul Bros. do not agree with us in thinking that cars must be made *strong enough*, then the only inference is that they propose building rolling stock which *will not* be strong enough. They may perhaps say that on a 3 ft. gauge the rolling stock will not be subjected to as destructive handling as on a wide gauge. If so, the reason is not apparent. If they know of some way by which railroad employes can be made more careful, or have any secret by which they can make those who are reckless careful, no doubt numbers of railroad managers will await anxiously its revelation. What we have said and again repeat is, that cars should be made heavy enough to stand the usage to which they will be subjected, and this is just what we think they would not do, if some of the plans proposed for narrow-gauge rolling stock were carried out. We are quite ready, however, to grant that the rolling stock of a road equipped exclusively with *light* cars and engines, would not be subjected to as severe strain as heavier rolling stock is; but this is an advantage attributable to the capacity and weight of the cars, and not to the width of the gauge.

EXAMINING AND LICENSING ENGINEERS.

The proposition that the State should provide for the protection of civil engineers, made by Mr. T. J. Nicholl in our colums a few weeks ago, has elicited considerable discussion in our own columns and in other technical journals. Educated and scientific engineers, especially when they are beginning the practice of their profession, are often disgusted to find that they must compete with a class of men who have learned the use of the transit and level, perhaps, and on the strength of these accomplishments call themselves engineers, and, moreover, often obtain employment in positions of some importance in competition with the well qualified engineer. It is not at all pleasant to have to acknowledge these men as engineers at all, and it is very provoking to see them take the places which better men would be glad to fill.

It is doubtless true that these quack engineers, like all other quacks, attain their success because their patrons are not able to distinguish between the capable and incapable members of the profession; therefore it is natural that qualified engineers should seek earnestly for some method by which their qualifications should be made known, as are the physician's by his diploma, the lawyer's by his admission to the bar, the clergyman's by his ordination or license to preach by the recognized authority of his church. This, we take it, is the thing chiefly aimed at by those who recommend State legislation on the subject.

But if it is proposed to prohibit the employment of engineers who have not passed a State examination, we shall have a great many hard question to solve immediately. What is an engineer, and what are engineering works? The township pathmaster has various bridges and viaducts to construct on the highways, rarely more than a few feet long. We would not require him to employ a licensed engineer, and we should not forbid him to take the advice of the neighbor who has had experience. The whole current of public opinion and practice, moreover, is against such restrictions, and a law which should forbid the employment of any one whomsoever as the engineer to superintend the construction of a private work would probably be ignored and evaded. It would be easier to make regulations applicable to public works, doubtless, and in many respects it would be desirable.

But we imagine that most engineers wish rather for some means to demonstrate their capacity than for the removal of competitors, educated or uneducated. "A fair field and no favor," as a correspondent says in another column, is all they ask; but they—the younger ones at least—wish that some pains should be taken to make the field fair. It is not impossible that the engineers themselves can do more than the State itself to protect themselves and the community from pretenders and incompetents. Their opinion of a man, publicly expressed, will have more weight with the public than any other possibly could. If engineers were organized, and a suitable examination were required of all members of their organization, and if engineers should recognize only such as had passed their examination as members of the profession, the public would be likely to recognize their verdict. Such an organization might have several different degrees, but the first would, doubtless, be the most important, for when a man has proved by long service or important works that he is a capable engineer, these are his all-sufficient recommendations.

Doubtless there would be difficulties in such a plan, the first of which would be to secure the general cooperation of the engineers; but there are difficulties in the way of any plan, and it is improvement rather than perfection that we would expect to secure.

THE PENNSYLVANIA REPORT.

The Pennsylvania Railroad by itself is by no means a great road, as far as length is concerned, though a very important one. The *company* is the most powerful of American corporations—perhaps we might omit the limiting word "'American"—because of the number and importance of the properties which it leases and manages, rather than because of the value of what it owns outright. It is like a farmer who owns a thousand acres of land and rents and work all the farms in three or four counties around, and is therefore a great farmer rather than a great land-owner. The Pennsylvania Railroad Company is a great railroad manager rather than a great owner of railroads, though the lines which it controls by holding a majority of their shares, or through the interest of its leading stockholders and officers, would pretty well supply more than one State.

In the report which we publish in this number three separate accounts are given: one for the Pennsylvania Railroad, one for the Philadelphia & Erie, and one for the Pittsburgh, Fort Wayne & Chicago, the two latter being leased lines. But the former includes many shorter leased lines. The property absolutely owned by the company is composed of the main line between Philadelphia and Pittsburgh, 355 miles (with double track), and five branches, amounting altogether to 36½ miles, so that the total mileage of the road is 391½ miles. But besides the two great railroads reported separately, it leases and operates seven branch lines in Pennsylvania varying in length from three to 64 miles, and measuring altogether just 200 miles; so the total length of line accounted for in the report headed "Pennsylvania Railroad" is 591½ miles, 355 miles of which is main line and 236 miles branch lines. This, then, is the mileage on

which was earned seventeen and a half millions in 1870. This is at the rate of $29,648 per mile, unequaled, we believe, on any other considerable system of roads in America, the New York Central & Hudson River, according to its late report to the State Engineer and Surveyor of New York, having earned $26,560 per mile on 842 miles of road, 516½ of which may reasonably be called "main line."

Now considering that for about one-half of 1870 rates on both freights and passengers were exceptionally low, and much of the time absurdly low, this is certainly a very remarkable return.

Compared with the previous year, it shows an increase in receipts of about $280,000, which is but a trifle more than 1½ per cent.; but the increase of business was much greater, the number of passengers carried being 3 per cent. more, and the number of tons of freight about 7½ per cent. more than in 1869. A corresponding increase in receipts would have amounted to about $1,065,000, and would have been $960,000 for freight alone, in which there was a decrease of about $140,000.

But it is evident that the Pennsylvania Railroad has reached that position when an increase in net earnings is not particularly desirable, all parties interested being munificently rewarded for their investments and the property at the same time constantly improving in excellence and value.

Besides the two 5 per cent. dividends paid last year, the company has considerably decreased the funded debt, substituted iron for wooden bridges, laid a considerable quantity of steel rails on its track, done much towards improving the eastern part of its line by straightening it, saving several miles between Philadelphia and Harrisburg, enlarged its shops and increased its rolling stock.

The Philadelphia & Erie road makes no such favorable exhibit. The 290 miles of this road earned the very handsome sum of $3,144,000, and this is nearly $11,000 per mile, which is nearly as much as any of our Western railroads, paying 10 per cent. dividends, make; but the operating expenses amount to 82 per cent. of the earnings, and the business is chiefly a through and mineral traffic, which command low rates, and it has to compete directly with the Erie Railway, which last year kept the rates extravagantly low a large part of the year. It is easier, of course, to make large net earnings from $3,000,000 received from a light business, at high rates, than from the same amount earned by a heavy business at low rates, because operating expenses must be in some proportion to the bulk of the traffic, and it costs more to do the heavy than the light business. But though the report does not say so, the Philadelphia & Erie road is likely to be a profitable property very soon, for aside from the material increase of business, it has connections with Duluth, the Northern Pacific and the Lake Superior & Mississippi roads, which promise to give it the largest part of the traffic to the Atlantic from that place and those lines. The earnings of the road in 1870 were about $178,000 less than in 1869, though there was an increase of 24 per cent. in the amount of freight carried, which, at the rates of the previous year, would have given an increase of $600,000 in receipts.

Not the least interesting part of the report is that relating to the Pittsburgh, Fort Wayne & Chicago Railway, which in the year 1870 earned $8,118,595, or $16,878 per mile, has been operated for less than 54 per cent., has paid the rental of 12 per cent. on the original capital stock, and left a profit to the Pennsylvania Company of more than a million, and all this when, as we supposed, for a large part of the year passengers were carried at the lowest rates known, freight at non-paying rates, and when, moreover, the fastest trains ever known in America made the cost of passenger transportation unusually costly! With this report before us there seems to be a plain case in favor of fast trains and low rates. We cannot compare these earnings with those of 1869, as the Pennsylvania Company reported for but six months of that year, and the Fort Wayne Company reported for the whole of the year ending June 30, 1869. During the last named year, however, the earnings were a little greater than those reported for 1870; and the last half-year of 1869 (the best half of the year, however,) were about $87,000 greater than half the earnings of 1870. But there has been a material decrease in operating expenses, which were nearly 64 per cent. in the last half of 1869 and but 54 per cent. in 1870. The state of things on this line should, it seems, suit all parties concerned. The lessors certainly should be satisfied with their generous rental, amounting to 12 per cent. on the stock held at the time of the lease; the patrons of the road should congratulate themselves that they have paid it less than before while it has done for them much more than before; and finally the lessees must feel very good over their million of clear profit.

Not the least satisfactory of the company's leased lines in its results is the Erie & Pittsburgh Railroad, which with 84 miles of road earned in ten months of 1870 $870,859, while its expenses were but 44 per cent. and the rental $258,875, so that a profit of $228,576 remained—about eight-ninths of the gross rental—which is certainly a very good profit, sufficient, we may say, to pay 23 per cent. upon all the Erie & Pittsburgh stock, which in the seven years previous has never paid any dividend.

The report announces the transfer of the lines west of Pittsburgh on the first of this month to the new corporation, the "Pennsylvania Company," (not the "Pennsylvania Railroad Bureau," as the telegraph reported it lately), "with a view to give greater simplici-" city and efficiency to this large Western interest."

The Pennsylvania Railroad Company is to have $8,000,000 of preferred stock in this company, and the remainder of the capital will be not more than $4,000,000 of common stock. The report promises 6 per cent. dividends on the preferred stock of this company after 1871.

So numerous are the interests of this company treated in this report that we are unable to touch upon any except the most important; for the rest we refer the reader to the report itself.

John B. Turner.

The Hon. John B. Turner of this city died very suddenly on Sunday morning last, at his home on the North Side.

Capt. Turner was born in 1799, in Saratoga County, New York. Owing little to the favors of fortune, his chief inheritance was a vigorous constitution and a sound understanding, which was early disciplined and strengthened in the school of active life. In his earlier years he was engaged as a contractor in the construction of the Erie Canal, the Rensselaer & Saratoga Railroad, and other public works in the State of New York. Removing to Illinois in 1842, he first settled at Blue Island, but soon established his permanent home in Chicago. He early became interested in the Galena —the pioneer railroad of Chicago—and was its President and active manager for many years during the period of its construction and greatest prosperity. Upon its consolidation with the Northwestern Railway in 1864, Captain Turner resumed his active connection with the road, and has since been a member of the Managing Committee of the latter company. He has held numerous other positions of trust and honor, was one of the Board of Commissioners by whom the Chicago Water Works were originally undertaken, and at the time of his death was a member of the Lincoln Park Commission.

The rule of "*mens sana in corpore sano*" had no more apt illustration than Capt. Turner. The vigorous, hearty physique was a true index of the healthful and active mind. Patient under difficulties, ready in emergencies, prudent in counsel, energetic in affairs, deliberate in judgment, firm in action, all his faculties were in equipoise, balancing and strengthening one another.

In public affairs and in his connection with the railroad interests of the Northwest, Captain Turner ranks among the foremost of those men, few in number, whose public spirit, energy and prescient sagacity laid, a quarter of a century ago, the broad and sure foundation of Chicago's commercial prosperity, whose small beginnings have already yielded their thousand fold. In recent conversations with Captain Turner, whose memory was unusually retentive and exact, we have especially noted the boldness and forethought which, in those early days, while yet the Galena road was struggling toward Freeport, had already devised for it a system of railroads covering the Northwest and reaching through the wilds of Iowa to touch the almost *terra incognita* of the "Missouri Slope." The original line of the Burlington road was included in the plan and was commenced under Captain Turner's management.

In public and private affairs Captain Turner was thoroughly upright and clear-headed, and signally scrupulous and exact in the performance of all duties and trusts. In manner he was a true gentleman, gentle, modest, cordial and straightforward. Age was with him not a season of decay and infirmity, but rather of ripening. Though of late years retired from active business, he continued to the last hale and vigorous, enjoying all of life, a keen observer, full of interest in the events of the day, traveling extensively and frequently, and "roughing it" on occasion, in the camp or on the road, with the zest of a boy.

His death was one befitting such a life. In the fullness of time he "fell asleep," and without a pain, a doubt or a fear his brave and honest soul passed the gates that open on the life beyond.

New Mississippi River Traffic.

A large part of the rails used in the Mississippi Valley are now imported by way of New Orleans, coming up the Mississippi in steamboats or barges. Freights from Liverpool to New Orleans are usually very low, as vessels carrying cotton from New Orleans cannot easily get cargoes back, and not infrequently are compelled to return in ballast. Once at New Orleans, the distances to all points on that river and west of it (direct) are less than the distances from New York, and river rates are naturally less than rails rate. The Mississipi Valley Transportation Company has recently completed a contract for the transportation of 20,000 tons of rails in barges from New Orleans up the river, and has just taken another to transport 30,000 tons.

Another new feature in the Mississippi River traffic is the transportation of pig iron from the furnaces at Grand Tower (on the Mississippi between St. Louis and Cairo) to New Orleans on the way to Philadelphia! It is to be mixed with Scotch pig there, rolled into rails, and then shipped back to Missouri to be used.

Short Cut to Lake Superior.

In the last annual report of Prof. Alexander Winchell, State Geologist of Michigan, he makes the following statement:

"In connection with post-tertiary phenomena, I have to call your attention to the discovery of an ancient outlet of Lake Superior, through the valley of the Au Train and Whitefish rivers, into Little Bay de Nocquet and Green Bay of Lake Michigan. A deep and bluff-lined valley, mostly with a limestone bottom, extends across the interval between Lake Superior and Little Bay de Nocquet, and the summit elevation between the two lakes is inconsiderable. It may easily be that this elevation is such as to justify the project of a ship canal across the divide, with the view of shortening the voyage between the ports on Lake Superior and those on Lake Michigan. The Au Train River, from its mouth for the distance of ten miles, has a current of four miles an hour. The stream is thirty to seventy-five feet in width, and one and a half to four feet in depth. Ten miles up it becomes walled in between cliffs of sandstone, and here is a fall of forty feet. Two miles above this is another fall of ninety-five feet from the summit level of the divide between the two lakes. The facilities for lockage are such that I think the State should at least place itself in possession of official information respecting this route; and I should be glad to be instructed to incur the moderate expense of running a line of levels over it from lake to lake."

The distance from the mouth of the Au Train to the head of Little Bay de Nocquet (which is a projection northward from the north end of Green Bay) the distance is only about thirty-five miles, and a canal across the peninsula at this place would open a direct route for vessels from Chicago nearly due north to Lake Superior. The northern end of the canal would be about twenty-five miles east of Marquette, and the distance between Chicago and that place, and all other points on Lake Superior west of it, would be 300 or 350 miles less than by way of Mackinaw and the Ste. Marie Canal. Probably, too, the cost of a passage through the proposed canal would be no more than for a passage through the Ste. Marie Canal. The construction of the Northern Pacific Railroad, and the prospective increase of business at the head of Lake Superior, make it especially desirable that a better and shorter route be opened between Lake Superior and Lake Michigan, and if the State of Michigan will not make the necessary surveys of the route, Chicago and Milwaukee can well afford to do so.

The Fuller Freight Bill.

The following is the text of Mr. Fuller's freight bill, as it passed to a third reading in the Senate by a unanimous vote. It will doubtless pass the House also:

The bill is entitled, "A bill for an act to prevent unjust discriminations and extortions in the rates to be charged by the different railroads in this State for the transportation of freight on said roads."

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly*, That no railroad corporation organized or doing business in this State, now in force or which may be hereafter enacted, shall charge or collect for the transportation of goods, merchandise or property, on its said road, for any distance, the same nor any larger or greater amount, as toll or compensation, than is at the same time charged or collected for the transportation of similar quantities of the same class of goods, merchandise or property over a greater distance upon the same road, nor shall such corporation charge different rates for receiving, handling or delivery, freight at different points on its road, or roads connected therewith, which it has a right to use. Nor shall any such railroad corporation charge or collect for the transportation of goods, merchandise or property, over any portion of its road, a greater amount as toll or compensation than shall be charged or collected by it for the transportation of similar quantities of the same class of goods, merchandise or property, over any other portion of its road of equal distance. And all such rules, regulations or by-laws of any such railroad corporation as fix, prescribe or establish any greater toll or compensation than is hereinbefore prescribed, are hereby declared to be void.

SEC. 2. The term "railroad corporation" contained in this act, shall be deemed and taken to mean all corporations, companies or individuals now owning or operating, or which may hereafter own or operate any railroad in this State.

SEC. 3. No railroad corporation shall increase its rates of toll or compensation to be charged for the transportation, receipt, handling or delivery of any property from any point on its line of road, to any other point on its line of road, by reason of any decrease in its rates which may be required to be made under the first section of this act; nor shall the rate of toll or compensation on any day hereafter, charged or collected for the transportation, receipt, handling or delivery of any property from any point on its line of road to any other point on its line of road, be greater or more than that charged or collected on the same day and month in the year one thousand eight hundred and seventy, for the transportation, receipt, handling or delivery of similar quantities of the same class of property over the same part or portion of said road. Whenever any railroad corporation as lessee or otherwise shall operate any other railroad or connection with its own road, the provisions of this act as to charges for carrying freight shall apply to such other road so operated, in like manner as if the same was a part of the line of road owned by the corporation operating the same, and for such purpose all lines of railroad operated by the same company shall be considered as one and the same road.

SEC. 4. Any railroad corporation which shall fix, demand, take or receive from any person or persons, any greater toll or compensation for the transportation, receipt, handling or delivery of goods or merchandise, in violation of the provisions of this act, shall forfeit and pay for any such offense, any sum not exceeding one thousand dollars, and costs of suit, including a reasonable attorney's fee, to be taxed by any court where the same is heard by appeal or otherwise to be recovered in an action of debt by the party aggrieved, in any court having jurisdiction thereof. And any officer, agent or employe of any such railroad corporation, who shall knowingly and willfully violate the provisions of this act, shall be liable to the penalties prescribed in this section.

SEC. 5. Any willful violation of any of the provisions of this act, on the part of any railroad corporation, shall be deemed and taken a forfeiture of its franchises; and such corporation so offending may be proceeded against by the State's Attorney in any circuit or county through or into which its road may run, by *scire facias*, or upon information in the nature of a *quo warranto* to judgment of ouster and final execution.

Pennsylvania Railroad Company's Twenty-fourth Annual Report.

OFFICE OF THE PENNSYLVANIA RAILROAD COMPANY, PHILADELPHIA, February 18, 1871.

To the Shareholders of the Pennsylvania Railroad Company:

Your directors have the pleasure to submit to you a very satisfactory report of the results of the business of the company for the past year. During that period the operations of the company have been very extensive, and have been attended with gratifying success.

THE EARNINGS

Of your main line and branches were:

From passengers	$3,595,371 20	
From emigrant passengers	162,671 92	
From mails	146,743 45	
From express matter	310,785 78	
From general freights	12,793,160 47	
From miscellaneous sources	522,974 00	
		$17,531,706 82

EXPENSES.

For conducting transportation	$3, 62,084 60	
For motive power	3,340,606 69	
For maintenance of cars	1,136,945 17	
For maintenance of road	3,058,685 78	
For general expenses	211,762 82	
		11,360,085 15
Leaving net earnings for 1870 of		$6,271,621 67

The total amount of revenues compared with last year is:

1870	$17,53 ,706 32
1869	17,250,811 73
Increase	$280,895 09

Changes in the sources of revenue are shown below:

Increase in first class passengers	$95 300 14	
" emigrants	31,605 99	
" mails	27,781 54	
" express matter	8,131 24	
" miscellaneous sources	257,572 59	
		$420,391 50
Decrease in freights		139,496 41
Increase, as above stated		$280, 95 09

The only item of income that shows a decrease is from freights, and this has occurred under an increased tonnage of 401,060 tons, and is mainly accounted for by the reduction of freight charges—without any legitimate object—during the past summer and autumn, by the New York lines, to a point much below the cost of transportation.

The gross revenues for 1870 are equal to $48,971.25 per mile for the main line of railroad.

The whole number of passengers carried in 1869 was 4,229,363, and in 1870, 4,352,769, an increase of 123,406, or nearly 3 per cent. The average distance traveled by each passenger was 34 65-100 miles, being 43-100 of a mile greater than in 1869.

The number of tons of freight moved (including 376,650 tons of fuel and other material transported for the company) was 5,804,051, embracing 2,550,389 tons of coal. It was, last year, 5,402,991 tons.

The average charge per net ton per mile upon freights, during the year, was 1 549-1000 cents, against 1 718-1000 cents last year, and 1 9-10 the year previous; and, per passenger, 2 49-100 cents per mile, against 2 51-100 cents last year, or an average decrease in freight charges of 9 8-10 per cent., and in passenger charges of 8-10 of one per cent. per mile.

The *actual* cost of operating your railroad, including branch lines, in 1870, was 59 15-100 per cent. of its receipts.

Earnings of the Philadelphia & Erie road in 1870, were:

From passengers	$ 606,438 31	
From freights	2,459,154 52	
From express matter	33,111 95	
From mails	2 ,000 00	
From miscellaneous sources	2 ,3 9 93	
Total (nearly $11, 00 per mile of road)		$3,144,044 71
The operating expenses during the same period were:		
For conducting transportation	$712,179 28	
For motive power	736,926 66	
For maintenance of cars	260,710 23	
For maintenance of way	867,912 25	
		2,577,728 42
Showing a balance to credit of P. & E. R. R.		$566,316 29

The number of tons moved over this railroad during the year was 1,614,287, against 1,302,041 tons in 1869. The average charge made per ton per mile on freights was 1 290-1000 cents, which is within 304-1000 cents of the actual cost of its transportation. The road passes through a sparsely populated region and meets the direct competion of the Erie Railway, the rates upon which have not for many years been adjusted with a view to dividends to its shareholders.

The r venues of the lines operated by this company and the amounts paid for their working expenses, interest and dividends, are as follows:

From the Pennsylvania Railroad and branches	$17,531,706 82
From the Pittsburgh, Ft. Wayne & Chicago Railway	8,118,595 60
From the Erie & Pittsburgh Railway (10 months)	870,859 23
From the Philadelphia & Erie Railway	3,144,044 71
	$29,665,206 36

And the expenses of operating these lines were:

Pennsylvania Railroad	$11,260,085 15	
Pittsburgh, Ft. Wayne & Chicago Railway, including rent, etc	7,052,011 95	
Erie & Pittsburgh Ralway, including rent, etc., (10 months)	642,281 76	
Philadelphia & Erie Railroad (including $566,316.29 net earnings, paid to that company)	3,144 044 71	
The loss upon advances to the Columbus, Chicago & Indiana Central Railway Company, to meet its floating debt, etc., and on the operations of the lease of the said company for 1870, amount, under an agreement and settlement with the lessee, to	1,166,892 94	
		$23,265,317 81
Leaving the net profits of the year 18 0 upon all the operations of the company		$6,399,888 85
From which deduct dividends declared in May and November (each 5 per cent.) with the taxes paid thereon	$3,45 ,357 50	
Balance to debt of interest account and the amount allowed discount on sale of bonds	1,799,161 38	
Due for the lease of the Harrisburg & Lancaster Railroad	134,821 89	
Annual payment to the State of Pennsylvania on account of interest and principal due upon the purchase of her works between Pittsburgh and Philadelphia	460,000 00	
		$5,849.330 77
Leaving a balance of credit to profit and loss of		$550,548 08

It will be noticed that this balance is the result of the business of the year, without bringing forward a similar surplus in 1869 amounting to $463,533, and after charging to expense account the additional cost of substituting iron bridges on the main line of your road for those originally constructed of wood; the change of steel for iron rails; the cost of the straightening of the old Philadelphia & Columbia Railway, purchased of the State, and the extension of the shops at Altoona, neither of which items of expenditures will add to the productive capacity of your railroad, but they may prevent serious interruptions to your traffic, and in time materially reduce the cost of operating the line

The operation of the Pittsburgh, Fort Wayne & Chicago Railway continue to show the favorable results confidently anticipated at the time the lease was made.

The earnings during the year 1870 were		$,118,595 60
And the operating expenses		4,371,987 53
Balance		$3,746,608 07
The annual rent, with interest on the bonds of the company, expenses of maintaining the organization, annual contribution to the sinking fund, etc., etc., amounted to		$2,680,024 42
Showing the surplus of the lease to be		1,066,583 65
The earnings of the Erie & Pittsburgh Railroad from March 1 to December 31, 1870—10 months—(operated under the General Manager of the Pittsburgh, Fort Wayne & Chicago Railway), were	$870,859 23	
And expenses for the same period were	383,425 76	
Balance	$487,433 47	
The interest on the bonds of the company, expenses of maintaining organization, etc., etc., during this period, amounted to	$258,875 00	
Showing a profit of		$228,576 47
Giving a profit on the leases of these two roads of		$1,295,160 12

The net revenues of the Pennsylvania Railroad Company from investments in other lines, it is confidently expected, will, after 1871, yield an amount fully sufficient to meet the interest upon the whole mortgage indebtedness of the company—a source of income which may be expected to continue and annually increase.

It is not the intention of the directors that the mortgage indebtedness of the company shall be increased beyond the thirty-five millions of dollars already authorized, as they consider that the other assets of the company, after exhausting this issue, will be ample to meet any enlargement of their works that may be required to comply with the public demand for transportation facilities.

The value of the existing sinking fund, instituted for the payment of the existing second mortgage bonds, will not only be sufficient to cancel the bonds issued under it when due, but a balance will be left which, if judiciously administered, will also pay off at maturity not only the first mortgage bonds, but also those of the general mortgage; while the lien of the State upon the Philadelphia & Columbia Railway is being paid off by the annual reduction of its principal, in accordance with the act of Legislature, to an extent which will extinguish it before its maturity.

From this summary the shareholders will notice that the interest upon the mortgage debt of the company after 1871 may be provided from interest upon installments outside of your railroad, and that this debt may be all canceled at maturity by the existing sinking fund, leaving the net earnings of your railroad, which last year amounted to $6,271,621.67 (after meeting the annual payment of $460,000 to the State) for the stockholders.

The Treasurer's statement, annexed to this report will exhibit the condition of the finances of the company at the close of the year. The discount allowed upon the large amount of general mortgage bonds sold in this country and Europe, to take up the company's debentures and meet its other obligations, has been met, as heretofore, by the net revenues of the company for 1870, instead of charging this item, as is usual with other companies, to the cost of investment.

To meet the demands upon the treasury during 1871, to complete the works in progress, that are deemed essential to protect the existing interests of the company, and pay the debentures, amounting to $1,109,224 falling due in July, the board proposes to give to each shareholder the privilege of subscribing for one share of stock for every six that may be standing in his name upon the books of the company on the 30th of April, at par. Under the terms of the general mortgage, there can be issued only one million one hundred and ninety-two thousand dollars of these bonds in addition to those already sold, until the debentures due in July are canceled and further payments are made upon the State debt and prior mortgages upon its line, when an additional issue equal to such reduction and payments may be made. The net revenues of the company in 1870 were in excess of the amount required to meet dividends of 10 per cent. upon the proposed increase of capital, and there is no reason to expect less favorable results in the future. To enable the company to provide for this distribution of stock, the directors accepted the provisions of the general act of Assembly of Pennsylvania, approved December 29, 1869, authorizing the increase of the capital of all railway companies 50 per cent.

The directors, in their last annual report, referred to the motives which induced them to depart from their original policy in extending their direct control of railways west of Pittsburgh. As this change has been made the subject of much public comment the board will be pardoned if they again briefly refer to it.

In consequence of the failure of the mixed system of canals and railroads of the Commonwealth of Pennsylvania, and their connecting lines beyond Pittsburgh, to attract a reasonable share of the traffic between the East and the West, or successfully compete with the avenues built by New York, all the lines of railway that were first built in the West to reach the Atlantic market were directed towards Buffalo as the then best and cheapest route to the East, leaving to this company, if it entered the list of competitors for this distant traffic, to endeavor without delay to secure in its interest railway connections with the commercial centers of the West as feeders to your main line. Sensible of the prejudice against large corporations since the failure of the United States Bank, the policy of this company was first directed to the procuring of these connections by securing the organization of the independent railway companies, and their construction by such pecuniary assistance as was required to effect this necessary object under contracts for the mutual interchange of business. This course, it was confidently expected, would meet the objects desired without involving the company in the direct management of distant enterprises.

It, however, soon became evident, after securing such feeders, that their success in diverting the traffic of the West from the channels it had become accustomed to follow, stimulated the older rival interests to endeavor to overcome it by obtaining the control of such feeders with a view to embarrass our business and augment their own. The efforts proved nearly successful, and were only prevented by promptly meeting the exigency by securing the absolute control of these lines for this company. The board think that they would have been derelict in their duty if they had yielded to timid counsels and permitted this opportunity to secure their object to pass unnoticed. This control was effected by the lease for nine hundred and ninety-nine years of the Columbus, Chicago & Indiana Central Railway, and of the Little Miami Railroad, through the Pittsburgh, Cincinnati & St. Louis Railway Company, which your company controls by the ownership of a large majority of its shares; and the direct lease of the Pittsburgh, Fort Wayne & Chicago, and the Erie & Pittsburgh Railways. Under the lease of the Pittsburgh, Fort Wayne & Chicago Railway this company became possessed also of one half the shares of the Indianapolis & St. Louis Railway Company (between Indianapolis and Terre Haute), which had a lease of the old line between Terre Haute, Alton and St. Louis. The Pennsylvania Railroad Company had previously acquired a majority of the shares of the new line between Terre Haute and St. Louis *via* Vandalia, thus completing our connections with St. Louis.

Under the amended lease of the Columbus, Chicago & I diana Central Railway, this company felt morally bound to assume its obligations to the Indianapolis & Vincennes Railroad Company, of which it is now nearly the sole shareholder. This enterprise is at present unprofitable, but will ere long prove a productive work, and when extended into Cairo, the grading of which is in a great measure finished, it will soon become a line of national importance.

It is not proposed nor is it desirable to manage these lines in a manner to divert traffic from its natural markets or channels, but solely with a view to secure to this company its fair share of the business of the West, which it was found impossible otherwise to obtain.

The result of the operation of all these lines for 1870 shows a small profit, which, under judicious mnaagement, must annually increase. The net profits for 1871, it is confidently expected, will be very satisfactory.

With a view to give greater simplicity and efficiency to the management of this large Western interest, and as far as practicable return to our former policy, a charter was obtained from the Commonwealth of Pennsylvania, incorporating the "Pennsylvania Company," to which all the interest above mentioned of the Pennsylvania Railroad Company will be transferred on the first of March next, and $8,000,000 of the preferred capital stock of the Pennsylvania Company received therefor, which amount covers fully all of our expenditures in this connection. The whole capital of the Pennsylvania Company will consist of $8,000,000 of preferred, and not exceeding $4,000,000 of common stock. All the

profits of the corporation during 1871, after meeting the obligations of the lines leased, are to be used by the managers in perfecting and equipping the railroads transferred to it. After 1871, the preferred shares of this company will yield at least 6 per cent. on their par value.

In addition to the interests of the company in the West to be transferred to the Pennsylvania Company, it still holds twenty-two thousand shares (a large majority) of the stock of the Cleveland, Mount Vernon & Delaware Railroad Company—whose line is partly finished, and the remainder in progress, under the judicious supervision of its President, Judge Hurd, of Mount Vernon, Ohio. This interest was received with the lease of the Pittsburgh, Fort Wayne & Chicago Railway, and promises to become a profitable investment; also, one million and forty-nine thousand dollars of the bonds of the Newport & Cincinnati Railroad Bridge, now being erected to connect the Little Miami Railway with the Kentucky system of railroads; four millions four hundred and forty-six thousand dollars of the general mortgage bonds of the Pittsburgh, Cincinnati & St. Louis Railway Company: one million seven seven hundred and sixty-six thousand dollars of the second mortgage bonds of the Terre Haute, Vandalia & St. Louis Railway Company, and eight hundred and seven thousand dollars of the first mortgage bonds of the Cincinnati & Muskingum Valley Railroad Company—the line of which is built from Zanesville to Morrow, 132 miles, and is being extended from Zanesville (16 miles) to Dresden, on the Pittsburgh, Cincinnati & St. Louis Railway. The interest upon all these bonds (amounting to $8,068,000) will be duly met from the revenues of these works.

This company also holds a majority of the shares of the stock of the Chartiers Railway Company, whose line between Pittsburgh and Washington is now approaching completion, and must soon become a profitable investment.

The liabilities of the Pennsylvania Railroad Company in the West, as guarantors, arise wholly under the leases that it has made or guaranteed, and extend to four millions of dollars of the first mortgage bonds of the Grand Rapids & Indiana Railroad Company—as required by the terms of the lease of the Pittsburgh, Fort Wayne & Chicago Railway. The Grand Rapids & Indiana Railroad Company, besides its railway, holds lands pledged for the payment of these bonds, valued at least at eight millions of dollars, and they cannot, therefore, reasonably become a charge upon this company, even if the railway should prove unproductive—an expectation which is not justified by the revenues of that portion of the line already built; to the bonds of the Indianapolis & Vincennes Railroad Company, amounting to three millions one hundred and fifty thousand dollars upon 114 miles of road, which will doubtless earn, after 1872, ample revenues to meet its interest and provide for the principal when due; to the interest upon thirty-six millions seven hundred and twenty-four thousand and fifty-two dollars of the bonds of the Pittsburgh, Fort Wayne & Chicago Railway Company and the Erie & Pittsburgh Railroad Company, and to fifteen million eight hundred and twenty-one thousand dollars of the bonds of the Columbus, Chicago & Indiana Central Railway Company. These works, as a whole, *now* yield net revenues *more* than sufficient to meet the interest upon all of the obligations mentioned, while the operation of the sinking fund of the Pittsburgh, Fort Wayne & Chicago Railway Company, the terms of which have been faithfully complied with, and the semi-annual amount due charged to running expenses, will pay off the whole of its mortgage indebtedness, amounting to $13,563,000, before the bonds are due.

From this general review of the interests of the company in the West, it will be perceived that, while securing to the company and this city uninterrupted communication with the trade centers of that region on and east of the Mississippi River, the board has at the same time also invested the means required to secure that object, so that they will yield satisfactory direct returns to this company.

The difficulties encountered by this company in securing harmonious railway connections with the West have also been met in its efforts to open communications with the capital of the Union with which the Northern Central Railway and your road have formed the most direct route of travel to and from the North and Northwest.

The Northern Central Railway Company fell for a time under the control of the Presidents of the Baltimore & Ohio and the Philadelphia & Reading Railroad companies, who represented interests adverse to those of this company, rendering the object we desire of no easy accomplishment. During the monetary panic in Baltimore, however, immediately after the election of President Lincoln, the interest of the first-named party, and many other shareholders in the Northern Central Company, was thrown upon the market, and immediately taken up by this company. The remaining shares required to make a majority of the stock of the company were purchased in London. This arrangement secured to the company a satisfactory connection with Baltimore; but to reach Washington the Baltimore & Ohio Railroad had still to be used. Every effort to obtain reasonable terms connecting our route with the national capital failed. Neither the sale of through tickets, the right to check through passenger baggage, or to run through trains, would be yielded, while the rates demanded upon freight passing over this line were quite prohibitory. These disadvantages were submitted to until the Baltimore & Ohio Railroad Company determined to extend a branch of their line to Pittsburgh, when further forbearance, it seemed, would be construed into weakness, and steps were at once taken, under the auspices of the Northern Central Railway Company, to build an independent line from Baltimore to the Potomac, at Washington. This road is now nearly ready for the rails, and will be immediately extended, by a tunnel under Baltimore, to the Northern Central Company's depot, and thus open to the capital of the Union direct and uninterrupted communication with the North, Northwest and Northeast.

The products of the anthracite coal fields and the white pine lumber regions of Pennsylvania, consumed in Washington and vicinity, that have heretofore been excluded from the Northern Central Railway by the exactions referred to, will, when this road is completed, furnish a large and increasing traffic to that line. To make this enterprise complete, arrangements have been made to extend the road across the Potomac, through Alexandria, to a junction with the Richmond, Fredericksburg & Potomac Railroad, northeast of Fredericksburg, thus forming a direct and continuous line of railway between all important points in the Southern Atlantic States with those of the North and East.

On reaching the Richmond, Fredericksburg & Potomac Railway, however, we unexpectedly met the restrictive policy which has heretofore governed most of the seaboard railroads south of New York, a policy which belongs to the past, and which we trust will soon be abandoned as inconsistent with the interests of the public and permanent interests of the shareholders of that company, and traffic be permitted to reach its destination and market whenever it will leave margin of profit to the transporter.

The privilege secured to the shareholders of the Harrisburg & Lancaster Railroad Company, under the lease of their railroad to this company, to convert their shares at par into the shares of the Pennsylvania Railroad Company, terminated on the twenty-ninth day of December last, leaving 7,056 shares, equal to $352,800 of the capital stock of that company still in the hands of individuals, upon which semi-annual dividends of three and a half per cent. have been guaranteed by this company.

The gradual alignment of the old Philadelphia & Columbia Railway is still in progress, and will be continued until the whole line is brought to the standard of modern railroads. That portion of the line between this city and Steamboat Station, in Chester County, where the most numerous and abrupt curvatures were laid, will be rebuilt and ready for use by the autumn of 1872. Grading upon this and other portions of the main line at points best suited for the purpose has been commenced for a third track, to avoid the vexatious detensions that now occur in passing trains in the same direction, traveling a different rate of speed.

There has not been much progress made by the Allegheny Valley Railroad Company toward the extension of its railroad (known as the "Low Grade Railway") to the Philadelphia & Erie Railroad, at Driftwood, except its relocation under the direction of John A. Wilson, Esq., Chief Engineer. His survey demonstrates the entire practicability of continuing a maximum gradient of eighteen feet per mile on straight lines from Columbia, Lancaster County, to near the summit of the Allegheny Mountains, and thence reaching the tunnel under the mountain by a short exceptional gradient of only thirty-six feet per mile, in favor of the heavy grades. The descent from the mountain to the Allegheny River is accomplished with a maximum gradient of sixteen feet per mile. We here have a line crossing the rugged Allegheny Mountains at an extreme elevation of only 1,440 feet above tidewater, with lower gradients than are found necessary in passing the plains of the Mississippi Valley. Upon such a line, when completed, freights in large quantities may be moved at one cent per net ton per mile, with a sufficient margin of profit to the transporter. This rate must draw to the line all the traffic south of the lakes, which now seeks the New York Canal.

The main object in the organization of the Pennsylvaina Railroad Company was to promote traffic between this city and the West. This object has been kept steadily in view, and is not inconsistent with the best interest of the shareholders. It was confidently expected on the completion of your railway that the enterprise and capital of the citizens of Philadelphia would have been at once enlisted in marketing the products brought to their doors, and the means furnished to distribute them to points of consumption. But it soon became evident that this could not be depended upon, and that our cars must pass to New York to meet purchasers of their contents or the business of the company would become dwarfed to that of a second-class railroad—a fate which the interests of the shareholders would not permit.

To remedy this difficulty this company, at an early period, offered to join the citizens or corporate authorties in establishing lines of steamers between this port and Liverpool, but without eliciting any favorable response until the present time, when the required stock subscription to such a line has been made. The success of the project now depends upon the purchase of one and a half millions of the bonds of the steamship company guaranteed by this company. The board has agreed to take a majority of the stock of this company not exceeding $400,000, and make this guarantee, and now submit their action for your approval. In the success of this enterprise the board has the fullest confidence, and it may be stated that the delay that has occurred in the organization of the line is not without its compensating advantages, as it will enable the company to profit by the very *great improvements* that have been made within the last ten years in the construction of steamers and their machinery, which have rendered almost obsolete steamships built previous to that date.

Even with the aid of this line of steamships, the tonnage capacity of your railway will be far in advance of the ability of this city to market, and the surplus must continue, as heretofore, to seek New York and other cities. In the adjustment of rates of freights from and to the West, the differences due to the shorter distances to Philadelphia have always been maintained. This discrimination, however, depends altogether upon the action of your board for the time being; but arrangements may be made by the corporate authorities of Philadelphia by which these differences will be permanently adhered to.

Your directors have had under consideration for some months the propriety of leasing the railways and canals of the joint companies between Philadelphia and New York, but have not as yet come to a satisfactory conclusion in relation to this very important question. The principal object desired by this company is to secure ample facilities for the accommodation of the large traffic that we can send to Jersey City, and its prompt delivery at that point. These joint companies have been unable or unwilling to give us the facilities desired, and our business is consequently restricted in its development, and the terminal expenses unnecessarily increased. The effect of such a lease will not be detrimental to the interests of this city, as it is intended to maintain the discrimination in rates of traffic that has always existed in her favor, while its influence upon the prosperity of your company must be material if the lease is obtained upon satisfactory terms. The rate at present demanded is greater than the joint companies have derived from the net profits of their lines for some years.

Your directors take much pleasure in acknowledging their indebtedness to the General Superintendent of the Pennsylvania Railroad, A. J. Cassatt, Esq., and his assistants, for the freedom from serious accidents on the road during the year, and for the very satisfactory reductions that have been made in the cost of operating the line, notwithstanding the increase of its tonnage. They also mention with commendation the success of the General Superintendent, W. A. Baldwin, Esq., of the Philadelphia & Erie Railroad, in the management of his line under the extremely low rates that it has been compelled to accept during the year.

To the General Manager of our leased lines beyond Pittsburgh, J. N. McCullough, Esq., we are especially indebted, for the very satisfactory profits that have been realized from the railways committed to his charge, under the low rates upon through freights that have prevailed during a larger portion of the last season. Respectfully submitted,

By order of the Board,

J. EDGAR THOMSON, President.

Atchison & Nebraska Railroad.

Mr. Firth, the Resident Engineer and Acting Superintendent, sends us the following clear description of the condition and prospect of this new railroad:

"Allow me to call your attention to the Atchison & Nebraska Railroad now in operation from Atchison to White Cloud, both in Kansas. The road now belongs to Mr. Joy's system, and during the coming season will be extended up the Nemaha Valley, in Nebraska, to Humboldt. Iron has been laid to the State line, (38 miles from Atchison), and after some six and a half miles of new road have been graded, the roadbed of the Burlington & Southwestern (yet unused) will be reached near Rulo, Neb. Iron has been laid upon that line between Rulo and Falls City, Neb. (about 12 miles), and the grading completed as far as Humboldt. This roadbed will be used by the Atchison & Nebraska Railroad. The grading from Atchison to the State line was done by a company of Atchison men mainly, who, being unable to fulfil their contract with the counties through which it passes, by putting iron upon the road, were fortunate enough to induce Mr. Joy to relieve them of the elephant. We began laying track late in September, and, owing to the very unusual amount of repairing of grading and bridging as well as delay of material and inclement weather, reached the Nebraska line January 11.

"Trains have been running regularly upon the road since January 1. The only connection north of Atchison at present is with the St. Joseph & Denver City Railroad, but this promises to be an important one on account of the Atchison & Nebraska furnishing a connection with St. Louis without crossing the Missouri River, and on account of the transfer boat at Atchison whereby loaded cars can be transferred between that road and its eastern connections. The temporary bridge at St. Joseph has proved rather expensive and not at all successful. The Atchison & Nebraska follows the Missouri bottom for 5 miles from Atchison, then cuts off the great bend of the river by St. Joseph and reaches its bank again at Iowa Point, 31 miles north of here; from that point to White Cloud it follows the bottom. The northern part of Kansas has been longer settled and more generally under cultivation than the southern, and the neighborhood of this road is generally a good, well-settled farming country, which promises at no very late day a good healthy local business. I send herewith a circular calling attention to the road and our new time table. The earnings of the road have not yet exceeded operating expenses, but this season, as you know, is the worst for a new enterprise to begin. The equipment of the road is good—Manchester engines, freight cars from Michigan Car Company; the passenger coaches, it must be admitted, have done service on the Chicago, Burlington & Quincy."

Detroit & Milwaukee.

The annual report for 1870 shows the gross earnings to be $1,421,122, being $194,495 less than in 1869, all of which is accounted for by losses at stations where competing roads cross the line, and compete with them for passengers and freight. The net earnings amounted to $503,233. All this is exclusive of the earnings of the steamer line between Grand Haven and Milwaukee, which is leased. The financial and general condition of the road is thought by the officers to be satisfactory.

—The earnings of the Grand Trunk Railway (1,377 miles) for the week ending February 4 were:

1871	£37,600
1870	24,300
Increase (5 per cent.)	£1,300

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WANTED—Purchasers for State or County rights to use Reece's Patent Lubricating Car Wheel. This wheel is so arranged that no dirt or water can get into the hub, and no oil can get out. Address, WM. R. REECE, Tremont, Schuylkill County, Pa.

AN ENGINEER experienced in railroad location and construction will be open to an engagement about the 1st of April (or perhaps sooner) as Principal Assistant or Chief, both of which positions he has occupied. For further information apply to the Edtior of this paper.

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A CIVIL ENGINEER who is thoroughly educated in his profession, has had experience in field work for several years, and is especially familiar with levelling and transit surveying, desires an engagement. Address TRANSIT, at the office of the RAILROAD GAZETTE.

AN ENGINEER, who has had nearly three years' experience in the use of the instruments, in railroad location and construction, wants a situation as assistant, either in Railroad or Mining Engineering. Address ASSISTANT, Gazette Office.

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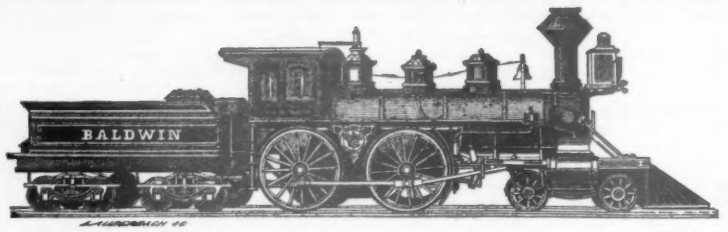

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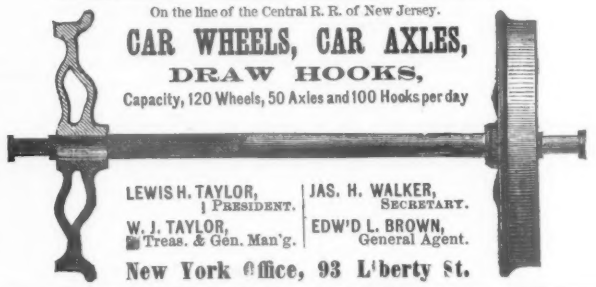

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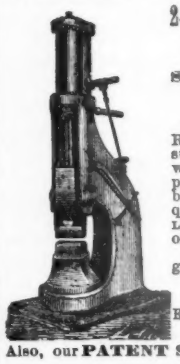

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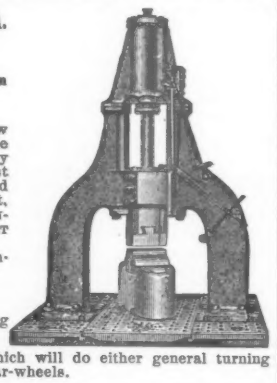

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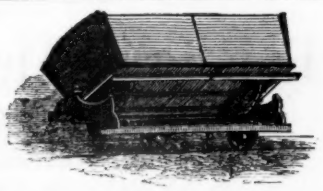

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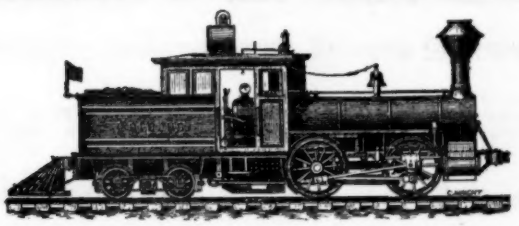

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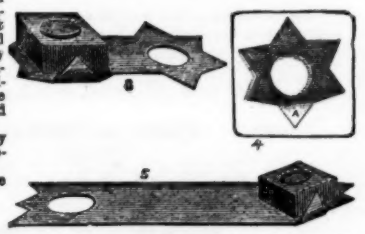

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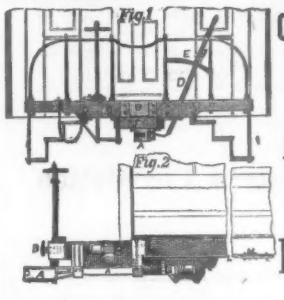

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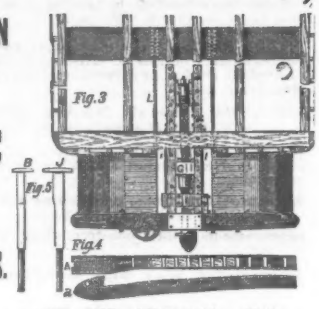

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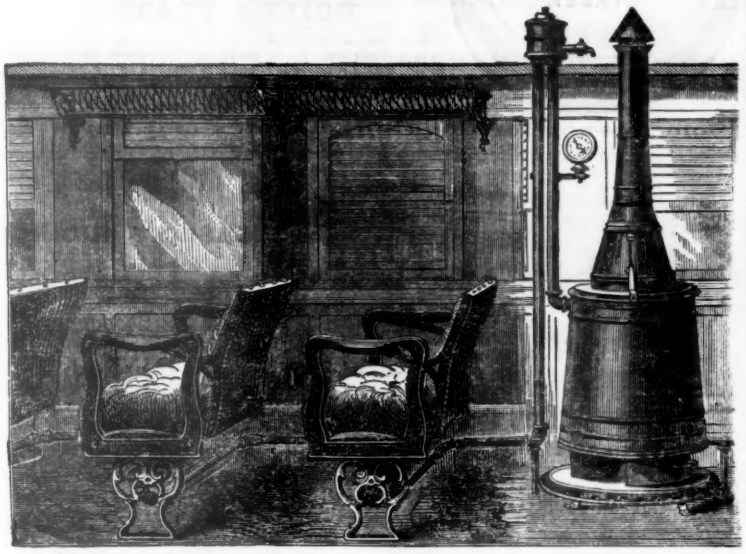

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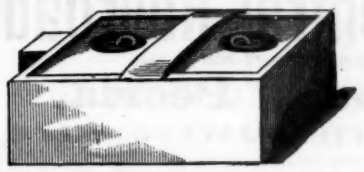

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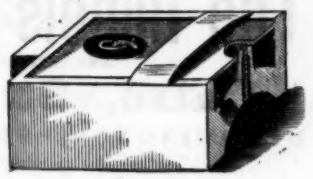

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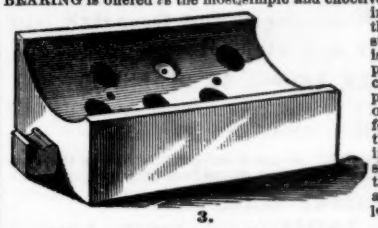

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THEY ARE ENABLED TO TAKE FREIGHT TO ALL POINTS WEST OF DUBUQUE ☞ WITHOUT CHANGE OF CARS! ☜

DELIVER FREIGHT IN CHICAGO ONLY at the FREIGHT DEPOT of the Company, foot of South Water St. Parties ordering Goods from the East should have the packages marked:

"Via Illinois Central Railroad."

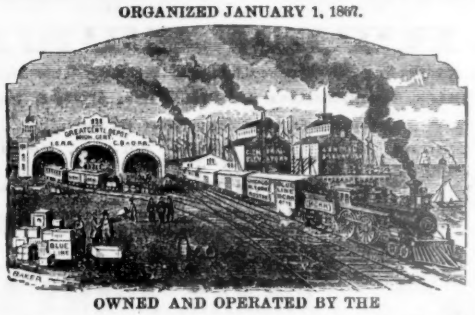
For THROUGH BILLS OF LADING, and further information, apply to the LOCAL FREIGHT AGENT at Chicago, or to the undersigned.

J. F. TUCKER, Gen. Freight Agt.

Great Central Route.

"BLUE LINE."

ORGANIZED JANUARY 1, 1867.

1871.  1871.

OWNED AND OPERATED BY THE

Michigan Central, Illinois Central, Chicago, Burlington & Quincy, Chicago & Alton, Great Western (of Canada), New York Central, Hudson River, Boston & Albany, and Providence and Worcester Railroads.

THE "BLUE LINE" is the only route that offers to shippers of freight the advantages of an unbroken gauge through from Chicago to the Seaboard, and to all Interior Points on the line of Eastern Connections beyond Suspension Bridge and Buffalo. All Through Freight is then transported between the most distant points of the roads in interest.

WITHOUT CHANGE OF CARS!

The immense freight equipment of all the roads in interest is employed, as occasion requires, for the through service of this Line, and has of late been largely increased. This Line is now prepared to extend facilities for the transit and delivery of all kinds of freight in Quicker Time and in Better Order than ever before.

The Blue Line Cars

are all of a solid, uniform build, thus largely lessening the chances of delay from the use of cars of a mixed construction, and the consequent difficulty of repairs, while remote from their own roads. The Blue Line is operated by the railroad companies who own it, without the intervention of intermediate parties between the Roads or Line and the public.

Trains run through with regularity **IN FOUR OR FIVE DAYS** to and from New York and Boston. Especial care given to the Safe and Quick Transport of Property Liable to Breakage or Injury, and to all **Perishable Freight.**

Claims for overcharges, loss or damage, promptly settled upon their merits. Be particular and direct all shipments to be marked and consigned *via*

"BLUE LINE."

☞ *FREIGHT CONTRACTS* given at the offices of the company in Chicago, New York and Boston.

J. D. HAYES, GEN. MANAGER,..Detroit. | P. K. RANDALL, 69 Washington St., Boston.
C. E. NOBLE,..... } 349 Broadway, N. Y. | J. JOHNSON,.....Cairo, Ill.
GEO. E. JARVIS,... } | N. D. MUNSON,.....Quincy, Ill.

THOS. HOOPS, GEN. FR'T AGT. Michigan Central Railroad, Chicago.
A. WALLINGFORD, AGT. M. C. & G. W. R. R., No. 91 Lake St., Chicago.
F. H. STEWART, Freight Agent Michigan Central Railroad.
JNO. CRAMPTON, Gen. Ft. Agt. Great Western Railway, Detroit, Mich.

Empire Line.

THE EMPIRE TRANSPORTATION COMPANY'S

Fast Freight Line to the East

—AND—

TO THE COAL AND OIL REGIONS,

Via Michigan Southern, Lake Shore, and Philadelphia & Erie R. R.'s,

WITHOUT TRANSFER!

Office, No. 72 LaSalle Street, Chicago.

GEO. W. RISTINE, Western Superintendent, Cleveland, Ohio.
W. G. Van Demark,..265 Broadway, New York. | E. L. O'Donnell,.....Baltimore, Md.
G. B. McCulloh,....413 South 5th St., Philadelphia. | Wm. F. Smith,.....Erie, Penn
JOHN WHITTAKER, Pier 14 North River, New York.

JOSEPH STOCKTON, Agent, Chicago.

W. T. HANCOCK, Contracting Agent.
WM. F. GRIFFITTS, Jr., Gen. Freight Agent, Philadelphia.

TAYLOR BROTHERS & CO.

CAST STEEL LOCOMOTIVE TYRES,

Best Yorkshire Bar Iron

— AND —

BOILER PLATES.

This Iron is unequaled for strength and durability, soundness and uniformity It is capable of receiving the highest finish, which renders it peculiarly adapted to the manufacture of Locomotive and Gun Parts, Cotton and other Machinery Chain Bolts, &c.

Sole Agency for the United States and Canada

The Lightest Running,

EASIEST RIDING,

— AND —

Most Economical

STREET CAR

IN USE.

HIGLEY'S PATENT

Street Car Running Gear

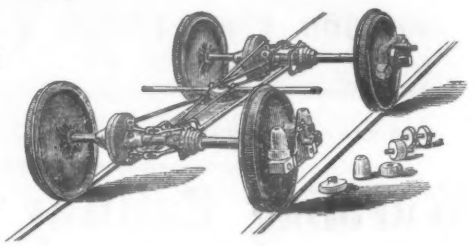
— AND —

BRAKE,

Made and Sold by

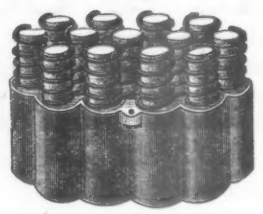
The McNairy & Claflen Manuf'g Co.

CLEVELAND, O.



Union Car Spring Mf'g Co.

Sole Proprietors of the



Wool-Packed Spiral.

Hebbard.

HEBBARD CAR SPRING!

Offices: No. 4 Dey St., New York, and 19 Wells St., Chicago.

FACTORIES: JERSEY CITY, N. J., and SPRINGFIELD, MASS.

Vose, Dinsmore & Co.,

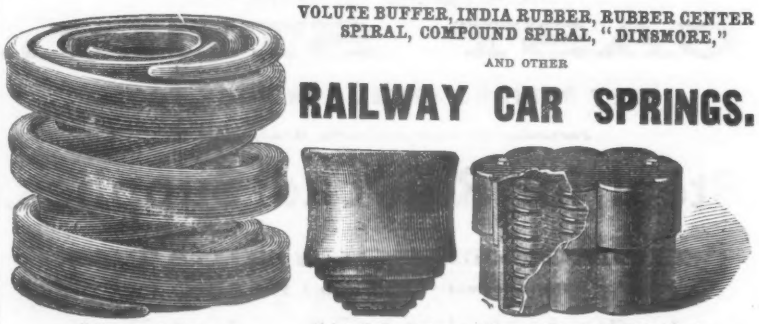
NATIONAL SPRING WORKS,

MANUFACTURERS OF

VOLUTE BUFFER, INDIA RUBBER, RUBBER CENTER SPIRAL, COMPOUND SPIRAL, "DINSMORE,"

AND OTHER

RAILWAY CAR SPRINGS.



"Dinsmore" Spring. Volute Buffer Spring. Group Rubber Center Spiral Spring.

No. 1 Barclay St., NEW YORK. | **No. 15 La Salle St., CHICAGO.**

WORKS ON 129th AND 130th STREETS, NEW YORK.

GEO. WESTINGHOUSE, Jr., Pres. ROBERT PITCAIRN, Treas. RALPH BAGALEY, Secretary

Westinghouse Air Brake Company,

OF PITTSBURGH. Incorporated by the State of Pennsylvania, 1869.

MANUFACTURERS OF

THE WESTINGHOUSE AIR BRAKE!

A simple, cheap and effective invention, whereby the entire control of a train of cars is placed in the hands of the Engineer. It is in daily use on a number of the leading Railroads, and is recommended by the most prominent railroad mechanics in the country as an actual necessity.

A Trial Train furnished to any Railroad Company, to be paid for only when found satisfactory. Full information furnished on application.

KANSAS CITY TO SOUTHWESTERN KANSAS.

THE SHORTEST ROUTE

IS VIA THE

Leavenworth, Lawrence,

—AND—

GALVESTON R. R. LINE.

Two Distinct Lines of Railway from Kansas City, Mo. & Lawrence, Kan.

UNITING AT **OTTAWA**, AND FROM THENCE A **TRUNK LINE** TO

INDIAN TERRITORY!

Passing Through the Finest Towns and Traversing the Richest Portion of this Splendid State.

TWO DAILY PASSENGER TRAINS EACH WAY,

Making Close Connection at Kansas City with all Roads East,

And at **THAYER**, (Southern Terminus), with

SOUTHWEST STAGE CO.'S OVERLAND COACHES,

For **WICHITA, SANTA FE and TEXAS.**

500,000 Acres Choice Farming Lands!

FOR SALE UPON THE MOST REASONABLE TERMS.

This Road also Passes through the Best Portion of the

Celebrated Osage Reservation!

NOW OPEN FOR SETTLEMENT.

Ask for Tickets via LEAVENWORTH, LAWRENCE & GALVESTON R. R., and Save TIME and MONEY!

CHAS. B. PECK, GEN. FREIGHT & TICKET AGENT.

M. R. BALDWIN, SUPERINTENDENT

MOORE
Steel Elastic Car Wheel Co.

OF NEW JERSEY.

Proprietors of

MOORE'S PATENT

FOR THE MANUFACTURE OF

ELASTIC CAR WHEELS,

FOR PASSENGER AND SLEEPING COACHES.

Noiseless, Safe, Durable and Economical.

Also, Manufacturers of

CAR WHEELS OF EVERY DESCRIPTION.

H. W. MOORE, President.
JAS. K. FROTHINGHAM, Secretary.
F. W. BLOODGOOD, Treasurer.

Works, cor. Green and Wayne Sts., JERSEY CITY, N. J
P. O. Address Box 129, Jersey City, N. J.

American Compound Telegraph Wire.

More than 3000 Miles now in Operation,

Demonstrating beyond question its superior working capacity, and great ability to withstand the elements. For RAILROAD LINES, connecting a single wire with a large number of Stations, and for long circuits, this wire is peculiarly adapted; the large conducting capacity secured by the copper, with other advantages, rendering such lines fully serviceable during the heaviest rains.

Having a core of steel, a small number of poles only are required, as compared with iron wire construction, thereby preventing much loss of the current from escape and very materially reducing cost of maintenance. OFFICE AMERICAN COMPOUND TELEGRAPH WIRE CO.
234 West 29th Street, New York.

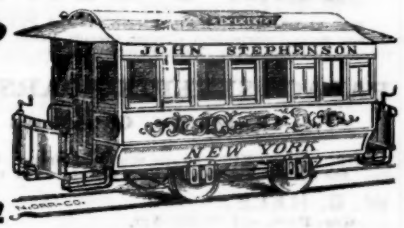
BLISS, TILLOTSON & CO., Western Agents.
247 South Water Street, Chicago.

OMNIBUSES

—OF—

EVERY STYLE!

☞ Orders Promptly Filled. ☜



CARS,

LIGHT, STRONG

—AND—

ELEGANT!

CHICAGO, ROCK ISLAND & PACIFIC
RAILROAD.

☞ THE DIRECT ROUTE FOR ☜

JOLIET, MORRIS, OTTAWA, LASALLE, PERU, HENRY, PEORIA,

Lacon, Geneseo, Moline,

ROCK ISLAND, DAVENPORT,

Muscatine, Washington, Iowa City,

GRINNELL, NEWTON, DES MOINES,

COUNCIL BLUFFS & OMAHA!

CONNECTING WITH TRAINS ON THE UNION PACIFIC RAILROAD, FOR

Cheyenne, Denver, Central City, Ogden, Salt Lake, White Pine, Helena, Sacramento, San Francisco,

And Points in Upper and Lower California; and with Ocean Steamers at San Francisco, for all Points in **China, Japan, Sandwich Islands, Oregon and Alaska.**

☞ TRAINS LEAVE their Splendid new Depot, on VanBuren Street, Chicago, as follows:

	LEAVE.	ARRIVE.
PACIFIC EXPRESS, (Sunday excepted)	**10.00 a. m.**	**4.15 p. m.**
PERU ACCOMMODATION, (Sundays excepted)	**4.30 p. m.**	**9.45 a. m.**
PACIFIC EXPRESS, (Saturdays excepted,)	**10.00 p. m.**	[Mon. ex. **7.00 a. m.**

ELEGANT PALACE SLEEPING COACHES!

Run Through to Peoria and Council Bluffs, Without Change.

☞ Connections at LA SALLE, with Illinois Central Railroad, North and South; at PEORIA, with Peoria, Pekin & Jacksonville Railroad, for Pekin, Virginia, &c.; at PORT BYRON JUNCTION, for Hampton, LeClaire, and Port Byron; at ROCK ISLAND, with Packets North and South on the Mississippi River.

☞ **For Through Tickets,** and all desired information in regard to Rates, Routes, etc., call at the Company's Offices, No. **37** South Clark Street, Chicago, or **257** Broadway, New York.

A. M. SMITH, Gen. Pass. Agent. HUGH RIDDLE, Gen. Supt. P. A. HALL, Asst. Gen. Supt.

KANSAS PACIFIC RAILWAY.

Great Smoky Hill Route

THROUGH **KANSAS** TO **DENVER,** COLORADO,

Connecting with the DENVER PACIFIC R. R. for CHEYENNE; forming, in connection with the UNION and CENTRAL PACIFIC R. R.'s, a NEW ALL-RAIL ROUTE to

Colorado, Wyoming, Utah, Montana,
NEVADA, CALIFORNIA,

AND THE PACIFIC COAST.

THE ONLY ROUTE RUNNING PULLMAN DRAWING-ROOM & SLEEPING CARS THROUGH TO DENVER.

☞ **No Omnibus or Ferry Transfer!** ☜

☞ Direct Connections made in UNION DEPOTS at **Kansas City** [State Line.] with the Hannibal & St. Joseph, North Missouri and Missouri Pacific Railroads.

☞ Daily Trains leave Kansas City, State Line and Leavenworth, for Lawrence, Topeka, Emporia, Humboldt, New Chicago, Chetopa, Junction City, Abilene, Salina, Brookville, Ellsworth, Hays, KIT CARSON, DENVER, GREELEY, CHEYENNE, OGDEN, SALT LAKE CITY, CORINNE,

Sacramento & San Francisco.

☞ Connect at Kit Carson with Southern Overland Passenger and Mail Coaches for PUEBLO, TRINIDAD, SANTA FE, and all principal points in

Old and New Mexico and Arizona.

☞ Connect at DENVER with the Colorado Central Railroad and Fast Concord Coaches, for Golden City, Black Hawk, Central City, Idaho City, Georgetown and Fair Play.

Passenger and Freight Rates as low and conveniences as ample as by any Route.

Ask for Tickets via KANSAS PACIFIC RAILWAY, which can be obtained at all principal ticket offices in the United States.

BEVERLY R. KEIM, Gen. Ticket Agt. Lawrence, Kansas. **T. F. OAKES, Gen. Freight Agt.** Kansas City, Mo. **A. ANDERSON, Gen. Sup't.** Lawrence, Kan.

FARMS AND HOMES IN KANSAS.

Five Million Acres of Choice Farming Lands, situated along the line of this Great National Route, at from one to six dollars per acre. For full particulars, apply to

JNO. P. DEVEREUX, Land Commissioner, Lawrence, Kan.

THE ERIE & PACIFIC DISPATCH CO.

Are Authorized Freight Agents.

For information, Contracts, and Bills of Lading, apply at their office, 64 Clark Street, Chicago.

H. H. RAPP, AGT.

Western Union Railroad.

CHICAGO & NORTHWESTERN DEPOT, CHICAGO. | MILWAUKEE & CHICAGO DEPOT, MILWAUKEE.

THE DIRECT ROUTE!
CHICAGO, RACINE & MILWAUKEE,

—TO—

Beloit, Savanna, Clinton, Pt. Byron, Davenport, Mineral Point, Madison, Freeport, Fulton, Lyons, Rock Island, Sabula, Galena, Dubuque, Des Moines, Council Bluffs,

OMAHA, SAN FRANCISCO

AND ALL PRINCIPAL POINTS IN

Southern and Central Wisconsin, Northern Illinois, and Central and Northern Iowa.

FRED. WILD, Gen. Ticket Agent. **D. A. OLIN,** Gen. Superintendent.

THE FAVORITE THROUGH PASSENGER ROUTE!

Chicago, Burlington & Quincy
RAILROAD LINE.

3 THROUGH EXPRESS TRAINS DAILY!

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
TO OMAHA, - - -	23	$20.00	TO DENVER, - -	2½	$63.00
" ST. JOSEPH, - -	21	19.50	" SACRAMENTO, -	4½	118.00
" KANSAS CITY, -	22	20.00	" SAN FRANCISCO,	5	118.00

TRAINS LEAVE CHICAGO from the Great Central Depot, foot of Lake Street, as follows:

BURLINGTON, KEOKUK, COUNCIL BLUFFS & OMAHA LINE

7:40 A. M. **MAIL AND EXPRESS,** (Except Sunday,) stopping at all stations; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Galena, Dunleith, Dubuque, LaSalle, El Paso, Bloomington, &c.

10:45 A. M. **PACIFIC FAST LINE,** (Except Sunday,) stopping at Riverside, Hinsdale, Aurora, Leland, Mendota, Princeton, Buda, Kewanee, Galva, Galesburg, and all stations West and South of Galesburg.
☞ ELEGANT DAY COACHES and **PULLMAN PALACE DRAWING ROOM CARS** are attached to this train daily from Chicago

TO COUNCIL BLUFFS & OMAHA WITHOUT CHANGE!

9.00 P. M. **PACIFIC NIGHT EXPRESS,** (Daily, except Saturday,) for Burlington, Ottumwa, DesMoines, Nebraska City, Council Bluffs, Omaha, and all points West. **Pullman Drawing Room Sleeping Car** attached to this Train daily from **Chicago to Burlington,** and Elegant Day Coaches, from **Chicago to Council Bluffs and Omaha, without change!** This is the Route between

CHICAGO, COUNCIL BLUFFS & OMAHA,

—RUNNING THE CELEBRATED—

Pullman Palace Dining Cars!

49 MILES THE SHORTEST ROUTE BETWEEN

Chicago & Keokuk,

And the Only Route Without Ferrying the Mississippi River!

QUINCY, ST. JOSEPH, LEAVENW'TH & KANSAS CITY LINE.

7.40 A. M. **MAIL AND EXPRESS** (Except Sunday,) stopping at all stations between Chicago and Galesburg; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Dunleith, Dubuque, La Salle, El Paso, Bloomington, &c.

10:45 A. M. **PACIFIC EXPRESS,** (Daily, except Sunday,) with ELEGANT DAY COACHES and PULLMAN'S PALACE SLEEPING CARS attached, running through from Chicago to KANSAS CITY, **Without Change!**

9:00 P. M. **PACIFIC NIGHT EXPRESS,** (Daily,) with **Pullman Palace Drawing Room Sleeping Car** attached running through from Chicago to QUINCY,

Kansas City, Lawrence, Topeka and Denver,

☞ WITHOUT CHANGE! ☜

64 MILES THE SHORTEST AND ONLY ROUTE BETWEEN

Chicago and Kansas City!

WITHOUT CHANGE OF CARS OR FERRY.

115 MILES The Shortest Route bet. Chicago & St. Joseph.

THE SHORTEST, BEST AND QUICKEST ROUTE BETWEEN CHICAGO AND

Atchison, Weston, Leavenworth, Lawrence,

AND ALL POINTS ON THE KANSAS PACIFIC R'Y.

Local Trains Leave

RIVERSIDE & HINSDALE ACCOMMODATION	7:00 A. M. 1:30 & 6:15 P. M
GALESBURG PASSENGER	3:00 P. M.
MENDOTA PASSENGER	4:15 P. M.
AURORA PASSENGER	5:30 P. M.

Ask for Tickets via Chicago, Burlington & Quincy Railroad, which can be obtained at all principal offices of connecting roads, at Company's office, 63 Clark Street, and at Great Central Depot, Chicago at as low rates as by any other route.

ROB'T HARRIS, Gen'l Superintendent, CHICAGO.
SAM'L POWELL, Gen'l Ticket Agent, CHICAGO.
E. A. PARKER, Gen. West. Pass. Agt., CHICAGO.

THE GREAT THROUGH PASSENGER ROUTE TO KANSAS

IS VIA THE OLD RELIABLE

HANNIBAL & ST. JOSEPH
SHORT LINE.

Crossing the Mississippi at Quincy and the Missouri at Kansas City on New Iron Bridges; running Three Daily Express Trains, Through Cars and Pullman Sleeping Palaces from Chicago & Quincy to St. Joseph & Kansas City.

The Advantages gained by this Line over any other Route from Chicago, are:

115 MILES THE SHORTEST!

To St. Joseph, Atchison, Hiawatha, Waterville, Weston, Leavenworth,

64 MILES THE SHORTEST!

To Kansas City, Fort Scott, Lawrence, Ottawa,

Garnett, Iola, Humboldt, Topeka, Burlingame, Emporia, Manhattan, Fort Riley, Junction City, Salina, Ellsworth, Hays, Sheridan, Olathe, Paola, Cherokee Neutral Lands, Baxter Springs, Santa Fe, New Mexico, and all Points on the KANSAS PACIFIC, and MISSOURI RIVER, FT. SCOTT & GULF R. R's, with which we connect at Kansas City Union Depot.

THIS BEING THE SHORTEST LINE AND QUICKEST, is consequently the cheapest; and no one that is posted thinks of taking any other Route from Chicago to reach principal points in

Missouri, Kansas, Indian Territory, or New Mexico.

DAILY OVERLAND STAGES from west end Kansas Pacific Railway, for Pueblo, Santa Fe, Denver, and points in Colorado and New Mexico.

THIS is also a most desirable Route, via St. Joseph, to Brownsville, Nebraska City, Council Bluffs, and Omaha, connecting with the Union Pacific Railroad for Cheyenne, Denver, Salt Lake, Sacramento, San Francisco, and the Pacific coast.

Through Tickets for Sale at all Ticket Offices. Baggage Checked Through, and Omnibus Transfers and Ferriage avoided.

P. B. GROAT, Gen. Ticket Agent. HANNIBAL, MO
GEO. H. NETTLETON, Gen. Supt. HANNIBAL, MO.

Old, Reliable, Air-Line Route!

CHICAGO, ALTON & ST. LOUIS R. R.

SHORTEST, QUICKEST AND ONLY DIRECT ROAD TO

Bloomington, Springfield, Jacksonville, Alton,

— AND —

ST. LOUIS!

WITHOUT CHANGE OF CARS.

THE ONLY ROAD MAKING IMMEDIATE CONNECTIONS AT ST. LOUIS WITH MORNING AND EVENING TRAINS

—FOR—

ATCHISON, LEAVENWORTH, KANSAS CITY.

Lawrence, Topeka, Memphis, New Orleans,

And All Points South and Southwest.

☞ TRAINS leave CHICAGO from the West-side Union Depot, near Madison Street Bridge. ☜

	Depart.	Arrive.
EXPRESS MAIL	*9:15 A. M.	*8:05 P. M.
JOLIET ACCOMMODATION	*4:00 P. M.	*9:40 A. M.
NIGHT EXPRESS	†5:30 "	*12:50 P. M.
LIGHTNING EXPRESS	‡9:00 "	*7:30 A. M.

*Sundays excepted.
†Daily; Saturdays it runs to Bloomington only.
‡Saturdays and Sundays excepted. Monday mornings this train runs from Bloomington to St. Louis.

This is the ONLY LINE Between CHICAGO & ST. LOUIS RUNNING

Pullman's Palace Sleeping and Celebrated Dining Cars!

BAGGAGE CHECKED THROUGH.

Through Tickets can be had at the Company's office, No. 55 Dearborn street, Chicago, or at the Depot, corner of West Madison and Canal streets, and at all principal Ticket Offices in the United States and Canada. Rates of Fare and Freights as low as by any other Route.

A. NEWMAN, Gen. Pass. Agent. **J. C. McMULLIN, Gen. Supt.**

North Missouri R. R.

PASSENGERS FOR

KANSAS AND THE WEST,

ARE REMINDED THAT

THE NORTH MISSOURI R. R.

— IS —

11 MILES SHORTER than any other Route!

BETWEEN

St. Louis and Kansas City.

15 Miles Shorter between ST. LOUIS and LEAVENWORTH

— AND —

50 MILES SHORTER TO ST. JOSEPH!

THAN ANY OTHER LINE OUT OF ST. LOUIS.

☞ **Three Through Express Trains Daily!** ☜

Pullman's Celebrated Palace Sleeping Cars on all Night Trains!

☞ **FOR TICKETS,** apply at all Railroad Ticket Offices, and see that you get your Tickets via St. Louis and North Missouri Railroad.

JAMES CHARLTON, Gen. Pass. and Ticket Agent, St. Louis.
W. R. ARTHUR, General Superintendent, St. Louis.

Pacific Railroad of Missouri.

THE MOST DIRECT AND RELIABLE ROUTE FROM ST. LOUIS THROUGH TO

KANSAS CITY, LEAVENWORTH & ATCHISON,

☞ WITHOUT CHANGE OF CARS! ☜

Close Connections at KANSAS CITY with Missouri Valley, Missouri River, Ft. Scott & Gulf, and Kansas Pacific R'ys, for Weston, St. Joseph, Junction City, Fort Scott, Lawrence, Topeka, Sheridan, Denver, Fort Union, Santa Fe, and

ALL POINTS WEST!

☞ At SEDALIA, WARRENSBURG and PLEASANT HILL, with Stage Lines for Warsaw, Quincy, Bolivar, Springfield, Clinton, Osceola, Lamar, Carthage, Granby, Neosho, Baxter Springs, Fort Gibson, Fort Smith, Van Buren, Fayetteville, Bentonville.

PALACE SLEEPING CARS on all NIGHT TRAINS.

Baggage Checked Through Free!

THROUGH TICKETS for sale at all the Principal Railroad Offices in the United States and Canadas. **Be Sure and Get your Tickets over the PACIFIC R. R. OF MISSOURI.**

W. B. HALE, Gen. Pass. and Ticket Agt.
THOS. McKISSOCK, General Superintendent.

ILLINOIS CENTRAL RAILROAD.

PASSENGER TRAINS LEAVE CHICAGO FROM THE GREAT CENTRAL DEPOT, FOOT OF LAKE ST.

ST. LOUIS AND CHICAGO
THROUGH LINE.

No Change of Cars from Chicago to St. Louis.

9:20 A. M. DAY EXPRESS Sundays Ex.
Arriving in ST. LOUIS at 10:30 P. M.

8:15 P. M. FAST LINE. Saturdays Excepted.
Arriving at ST. LOUIS at 8:00 A. M.

AT ST. LOUIS, Direct Connections are Made FOR

Jefferson City, Sedalia, Pleasant Hill, Macon, Kansas City,

LEAVENWORTH, ST. JOSEPH & ATCHISON,

—Connecting at KANSAS CITY for—

LAWRENCE, TOPEKA, JUNCTION CITY, SALINA, SHERIDAN,

Denver and San Francisco!

CAIRO, MEMPHIS AND NEW ORLEANS LINE.

No Change of Cars from Chicago to Cairo.

9:20 A. M. CAIRO MAIL, Sundays Excepted.
Arriving at **Cairo** 2:05 A. M., **Memphis** 12:45 P. M., **Mobile** 9:25 A. M. **Vicksburg** 9:25 A. M., **New Orleans** 11:05 A. M.

8:15 P. M. CAIRO EXPRESS, Except Saturdays.
Arriving at **Cairo** 12:24 P. M., **Memphis** 4:15 A. M., **Little Rock** 7:00 P. M., **Vicksburg** 8:10 P. M., **New Orleans** 1:30 A. M.

4:50 P. M. CHAMPAIGN PASSENGER,
Arriving at **Champaign** at 10:45 P. M.

☞ THIS IS THE ONLY DIRECT ROUTE TO

Humboldt, Corinth, Grand Junction, Little Rock, Hot Springs, Selma, Canton, Grenada, Columbus, Meridian, Enterprise,

MEMPHIS, VICKSBURG, NEW ORLEANS & MOBILE.

At NEW ORLEANS, connections are made for

GALVESTON, INDIANOLA,

And all Parts of Texas.

☞ NOTICE.—This Route is from 100 to 150 MILES SHORTER, and from 12 to 24 HOURS QUICKER than any other.

THIS IS ALSO THE ONLY DIRECT ROUTE TO

DECATUR, TERRE HAUTE, VINCENNES & EVANSVILLE.

Peoria and Keokuk Line.

9:20 A. M. KEOKUK PASSENGER, Sun. Excepted.
Arriving at **Chenoa** 3:20 P. M., **El Paso** 4:08 P. M., **Peoria** 5:42 P. M., **Canton** 7:15 P. M., **Bushnell** 8:57 P. M., **Keokuk** 11:15 P. M., **Warsaw** 11:40 A. M.

Elegant Drawing Room Sleeping Cars

ATTACHED TO ALL NIGHT TRAINS.

Spacious and Fine Saloon Cars!

WITH ALL MODERN IMPROVEMENTS, RUN UPON ALL TRAINS.

BAGGAGE CHECKED THROUGH TO ALL IMPORTANT POINTS.

☞ For Through Tickets, Sleeping Car Berths, Baggage Checks, and information, apply at the office of the Company in the Great Central Depot, foot of Lake St.

Hyde Park and Oakwoods Train.

	LEAVE.	ARRIVE.		LEAVE.	ARRIVE.
HYDE PARK TRAIN,...	*6:20 A. M.	*7.45 A. M.	HYDE PARK TRAIN,...	*3:00 P. M.	*5:15 P. M
HYDE PARK TRAIN...	*8:00 A. M.	*9.30 A. M.	HYDE PARK TRAIN,...	*6:10 P. M.	*7:35 P. M
HYDE PARK TRAIN,..	*12:10 P. M.	*1:45 P. M.			

* Sundays Excepted.

W. P. JOHNSON, Gen. Pass. Agent.

CHICAGO & NORTHWESTERN R. W.

Comprising the PRINCIPAL RAILROADS from CHICAGO Directly NORTH NORTH-WEST and WEST.

ALL RAIL TO THE PACIFIC OCEAN!

Great California Line.

TRAINS LEAVE WELLS STREET DEPOT AS FOLLOWS:

8:30 A. M. Clinton Passenger.	**10:00 P. M.** Night Mail.
10:45 A. M. Pacific Express.	**10:00 P. M.** Rock Island Pass.
10:45 A. M. Rock Island Exp.	**4:00 P. M.** Dixon Passenger.

For Sterling, Rock Island, Fulton, Clinton, Cedar Rapids, Boone, Denison, Missouri Valley Junction, Sioux City, Council Bluffs and Omaha, there connecting with the

UNION PACIFIC R. R.

For Cheyenne, Denver, Ogden, Salt Lake, the White Pine Silver Mines, Sacramento, San Francisco, and all parts of Nebraska, Colorado, New Mexico, Arizona, Wyoming, Montana, Idaho, Utah, Nevada, and the PACIFIC COAST.

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
To OMAHA,.....	23	$20.00	To SACRAMENTO,..	4½	$118.00
" DENVER,.....	52	65.00	" SAN FRANCISCO, 5		118.00

TRAINS ARRIVE:—Night Mail, 7.15 a. m.; Dixon Passenger, 11.10 a. m.; Pacific Express 4:15 p. m.; Rock Island Express, 4:15 p. m.; Clinton Passenger, 6:45 p. m.

FREEPORT LINE.

9.00 A. M. & 9.00 P. M. For Belvidere, Rockford, Freeport, Galena, Dunleith, and St. Paul.

4.00 P. M., Rockford Accommodation.
5.30 P. M., Geneva and Elgin Accommodation
6.10 P. M., Lombard Accommodation.
5:50 P. M., Junction Passenger.

TRAINS ARRIVE:—Freeport Passenger, 2:30 p. m., 6:40 a. m.; Rockford Accommodation 11:10 a. m.; Geneva and Elgin Accommodation, 8:45 a. m.; Junction Passenger, 8:10 a. m.; Lombard Accommodation, 6:50 a. m.

WISCONSIN DIVISION.

☞ Trains leave Depot, cor. West Water and Kinzie Sts., daily, Sundays excepted, as follows:

10.00 A. M. DAY EXPRESS, for Janesville, Monroe, Whitewater, Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Neenah, Appleton, and Green Bay.

3.00 P. M., Janesville Accommodation.

5.00 P. M. NIGHT EXPRESS, for Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Menasha, Appleton, Green Bay, and THE LAKE SUPERIOR COUNTRY.

5.30 P. M., Woodstock Accommodation.

TRAINS ARRIVE:—7:00 a. m., 7:15 p. m., 9:00 a. m., and 2:05 p. m.

MILWAUKEE DIVISION.

MILWAUKEE MAIL,.....	8:15 A. M.
EXPRESS, (ex. Sun.) Waukegan, Kenosha, Racine and Milwaukee,.....	9:45 A. M.
EVANSTON ACCOMMODATION,.....	1:00 P. M.
HIGHLAND PARK PASSENGER,.....	6:20 P. M.
MILWAUKEE ACCOMMODATION, with Sleeping Car attached.....	11:00 P. M.
KENOSHA ACCOMMODATION, (Sundays excepted) from Wells St. Depot.....	4:10 P. M.
AFTERNOON PASSENGER,.....	5:00 P. M.
WAUKEGAN ACCOMMODATION, (except Sundays) from Wells St. Depot.....	5:30 P. M.

TRAINS ARRIVE:—Night Accommodation, with Sleeping Car, 5:00 a. m.; Day Express, 4:15 p. m. Milwaukee Mail, 10:30 a. m.; Afternoon Passenger, 7:40 p. m.; Waukegan Accommodation, 8:25 a. m.; Kenosha Accommodation, 9:10 a. m.; Evanston Accommodation, 3.30 p. m.; Highland Park Passenger, 7.55 p. m.

PULLMAN PALACE CARS ON ALL NIGHT TRAINS.

THROUGH TICKETS Can be purchased at all principal Railroad Offices East and South, and in Chicago at the Southeast corner of Lake and Clark Streets, and at the Passenger Stations as above.

H. P. STANWOOD, Gen. Ticket Agt.

JOHN C. GAULT, Gen'l Supt.

Milwaukee & St. Paul R. W.

THE ONLY ALL RAIL LINE TO

ST. PAUL AND MINNEAPOLIS!

AND ALL PORTIONS OF

Wisconsin, Minnesota & Northern Iowa.

PURCHASE TICKETS VIA MILWAUKEE.

Passengers Going via Milwaukee,

Have Choice of Seats in Clean Coaches, and on Night Trains, a full night's rest in Palace Sleeping Cars.

☞ BAGGAGE CHECKED THROUGH BY THIS ROUTE ONLY! ☜

PASSENGERS FROM CHICAGO can obtain these Advantages only by he MILWAUKEE DIVISION of the CHICAGO & NORTHWESTERN R'Y.

SPECIAL NOTICE.—Passengers destined to any place in Wisconsin, Minnesota, or Northern Iowa, either on or off the Lines of this Company, who cannot procure Through Tickets to their destination, should purchase their Tickets **TO MILWAUKEE,** as this is the Great Distributing Point for these States.

A. V. H. CARPENTER, Gen. Pass. Agt. Milwaukee.

S. S. MERRILL, Gen. Manager, Milwaukee

61 Miles the Shortest Line!

— FROM —

CHICAGO TO NEW YORK.

Pitts., Ft. Wayne & Chicago

— AND —

PENNSYLVANIA CENTRAL

IS THE ONLY ROUTE

Running its Entire Trains THROUGH to Philadelphia and New York, and the only Route running Three Daily Lines of Pullman Day and Sleeping Palaces, from Chicago to

PITTSBURGH, HARRISBURG,

PHILADELPHIA & NEW YORK,

☞ WITHOUT CHANGE! ☜

WITH BUT ONE CHANGE TO

BALTIMORE, PROVIDENCE, NEW HAVEN, HARTFORD, SPRINGFIELD, WORCESTER & BOSTON!

AND THE MOST DIRECT ROUTE TO WASHINGTON.

☞ Trains Leave WEST SIDE UNION DEPOT, corner West Madison and Canal Streets, as follows:

	Mail.	Fast Express.	Pacific Exp.	Night Exp.
Leave—CHICAGO	5.30 A. M.	9.00 A. M.	5.15 P. M.	9.00 P. M.
Arrive—PLYMOUTH	9.50 "	12.03 P. M.	8.45 "	12.35 A. M.
" FORT WAYNE	12.30 P. M.	2.05 "	11.15 "	3.10 "
" LIMA	3.24 "	4.06 "	1.23 A. M.	5.40 "
" FOREST	4.43 "	5.08 "	2.45 "	7.07 "
" CRESTLINE	6.20 "	6.30 "	4.20 "	8.55 "
Leave—CRESTLINE	6.00 A. M.	6.50 "	4.30 "	9.35 "
Arrive—MANSFIELD	6.40 "	7.17 "	5.00 "	10.05 "
" ORRVILLE	9.15 "	9.05 "	6.54 "	11.55 "
" ALLIANCE	11.10 "	10.40 "	8.30 "	1.30 P. M.
" PITTSBURGH	3.45 P. M.	1.55 A. M.	12.10 P. M.	4.40 "
" CRESSON	11.57 "	5.44 "	4.48 "	10.00 "
" ALTOONA	12.48 A. M.	6.55 "	5.55 "	2.40 A. M.
" HARRISBURG	5.30 "	11.25 "	10.45 "	2.50 "
" PHILADELPHIA	6.50 "	3.15 "	3.00 "	6.50 "
" NEW YORK, VIA PHILADELPHIA	10.30 "	6.30 "	6.41 "	10.30 "
" NEW YORK, VIA ALLENTOWN	10.30 "	6.30 "	.....	10.30 "
" BALTIMORE	9.15 P. M.	3.05 "	2.30 A. M.	9.15 P. M.
" WASHINGTON	1.00 "	5.15 "	5.45 "	1.00 "
" BOSTON	9.00 "	5.50 A. M.	6.00 "	9.00 "

Boston and New England Passengers will find this Route especially Desirable, as it gives them an opportunity of Seeing the FINEST VIEWS AMONG THE ALLEGHANY MOUNTAINS,

Besides Visiting PITTSBURGH, PHILADELPHIA and NEW YORK, without extra cost!

☞ All New England Passengers holding Through Tickets will be Transferred, with their Baggage, to Rail and Boat Connections in NEW YORK, **Without Charge!**

THROUGH TICKETS for sale at the Company's Offices, at 65 Clark St.; 52 Clark St.; cor. Randolph and LaSalle Sts.; and at Depot, Chicago. Also at Principal Ticket Offices in the West.

CLOSE CONNECTIONS Made at LIMA for all Points on the Dayton & Michigan and the Cincinnati, Hamilton & Dayton Railways, and at CRESTLINE for Cleveland and Columbus.

Express Trains are Equipped with WESTINGHOUSE AIR BRAKES,

The Most Perfect Protection Against Accidents in the World!

F. R. MYERS, Gen. Pass. & Tkt Agt. P. F.W. & C. R'y Chicago. | **W. C. CLELAND,** Gen. Western Pass. Agt. P. F. W. & C. R'y, Chicago

T. L. KIMBALL, Gen. Western Pass. Agt. Penn. Cen. R. R. Chicago.

Broad Gauge! Double Track!

ERIE RAILWAY.

4 EXPRESS TRAINS DAILY!

From Cleveland, Dunkirk and Buffalo, 625 Miles, to New York, WITHOUT CHANGE of Coaches!

☞ The Trains of this Railway are run in DIRECT CONNECTION WITH ALL WESTERN AND SOUTHERN LINES, for

Elmira, Williamsport, Oswego, Great Bend, Scranton, Newburgh,

NEW YORK, ALBANY, BOSTON, PROVIDENCE,

AND PRINCIPAL NEW ENGLAND CITIES.

New and Improved DRAWING ROOM COACHES are attached to the DAY EXPRESS Running THROUGH TO NEW YORK.

☞ **SLEEPING COACHES,** Combining all Modern Improvements, with perfect Ventilation and the peculiar arrangements for the comfort of Passengers incident to the **BROAD GAUGE,** accompany all night trains to New York.

CONNECTIONS CERTAIN! as Trains on this Railway will, when necessary, **wait from one to two hours for Western trains.**

All Trains of Saturday run directly Through to New York.

☞ **Ask for Tickets via Erie Railway,** which can be procured at **66 Clark Street** Chicago, and at all Principal Ticket offices in the West and Southwest.

L. D. RUCKER, General Superintendent, New York. | **A. J. DAY,** Western Passenger Agent, Chicago. | **WM. R. BARR,** Gen'l Passenger Agent, New York

Pan-Handle

— AND —

Penn'a Central Route East!

☞ SHORTEST AND QUICKEST ROUTE, VIA COLUMBUS, TO ☜

PITTSBURGH, BALTIMORE, PHILADELPHIA & NEW YORK

On and after Sunday, NOVEMBER 20th, 1870, Trains for the East will run as follows:

[DEPOT CORNER CANAL AND KINZIE STS., WEST SIDE.]

7:40 A. M. DAY EXPRESS. [SUNDAYS EXCEPTED.] Via Richmond. Arriving at

COLUMBUS	3:00 A. M.	HARRISBURG	10:35 P. M.	NEW YORK	6:40 A. M.	WASHINGTON	5:45 A. M
PITTSBURGH	12:15 M.	PHILADELPHIA	3:10 A. M.	BALTIMORE	2:30 A. M.	BOSTON	5:05 P. M

7:10 P. M. NIGHT EXPRESS. [SUNDAYS EXCEPTED.] Arriving at:

COLUMBUS	11:15 A. M.	HARRISBURG	5:20 A. M.	NEW YORK	11:40 A. M.	WASHINGTON	1:10 P. M
PITTSBURGH	7:35 P. M.	PHILADELPHIA	9.50 A. M.	BALTIMORE	9:30 A. M.	BOSTON	11:50 P. M

Palace Day and Sleeping Cars

Run Through to COLUMBUS, and from Columbus to NEW YORK, WITHOUT CHANGE!

ONLY ONE CHANGE TO NEW YORK, PHILADELPHIA, OR BALTIMORE!

CINCINNATI & LOUISVILLE AIR LINE SOUTH.

35 Miles the Shortest Route to Cincinnati.
18 Miles the Shortest Route to Indianapolis and Louisville

3 Hours the Quickest Route to Cincinnati!

THE SHORTEST AND BEST ROUTE TO

Columbus, Chillicothe, Hamilton, Dayton, Wheeling, Zanesville, Parkersburg, Marietta, Evansville, Lexington, Terre Haute, Nashville,

ALL POINTS IN CENTRAL & SOUTHERN OHIO, & INDIANA, KENTUCKY & VIRGINIA.

— QUICK, DIRECT AND ONLY ALL RAIL ROUTE TO —

New Orleans, Memphis, Mobile, Vicksburg, Charleston, Savannah,

AND ALL POINTS SOUTH.

Cincinnati, Indianapolis and Louisville Trains run as follows:

THROUGH WITHOUT CHANGE OF CARS!

7.40 A. M. (Sundays excepted) Arriving at

LOGANSPORT	1:15 P. M.
KOKOMO	2:33 P. M.
CINCINNATI	10:10 P. M.
INDIANAPOLIS	5:00 P. M.
LOUISVILLE	11:30 P. M.

8.05 P. M. (Saturdays excepted.) Arriving at

LOGANSPORT	1:15 A. M.
KOKOMO	2:31 A. M.
CINCINNATI	9:35 A. M.
INDIANAPOLIS	5:40 A. M.
LOUISVILLE	3:50 P. M

Lansing Accommodation: Leaves 3:40 P. M. Arrives 10:55 A. M.

PULLMAN'S PALACE SLEEPING CARS!

Accompany all Night Trains between Chicago and Cincinnati or Indianapolis.

☞ Ask for Tickets **via COLUMBUS** for the East, and **via "The AIR LINE"** for Cincinnati, Indianapolis, Louisville and points South. Tickets for sale and Sleeping Car Berths secured at **95 RANDOLPH STREET, CHICAGO,** and at Principal Ticket Offices in the West and Northwest.

WM. L. O'BRIEN, Gen. Pass. and Ticket Agent, Columbus. | **I. S. HODSDON** Northwestern Pass. Agt. Chicago.

D. W. CALDWELL Gen. Supt. Columbus.

The Great Favorite Route for Missouri, Nebraska and Iowa.

KANSAS CITY, ST. JOSEPH

— AND —

COUNCIL BLUFFS

☞ THROUGH LINE! ☜

3 EXPRESS PASSENGER TRAINS Leave Union Depot Daily, on the arrival of Eastern Southern and Western Trains, crossing the Missouri River on the New Iron Bridge at KANSAS CITY, passing the cities of

LEAVENWORTH, ATCHISON, SAINT JOSEPH,

— AND —

NEBRASKA CITY.

Connecting at COUNCIL BLUFFS with Iowa Lines for all prominent points in Iowa, and making DIRECT CONNECTION at **OMAHA** with the Great **Union Pacific Railroad,** for

CHEYENNE, DENVER, SALT LAKE, SACRAMENTO, SAN FRANCISCO

And the Pacific Coast.

Pullman's Palace Sleeping Cars!

ON ALL NIGHT TRAINS.

☞ Ask for Tickets via the People's Favorite Route, **Kansas City, St. Joseph & Council Bluffs Railroad Line.**

A. L. HOPKINS, Gen. Superintendent ST. JOSEPH, Mo. | **A. C. DAWES,** Gen. Passenger Agent, ST. JOSEPH, Mo.

LAKE SHORE
— AND —
MICHIGAN SOUTHERN R.W.

THE GREAT THROUGH LINE BETWEEN

CHICAGO, BUFFALO & NEW YORK,

WITHOUT CHANGE!

AND THE ONLY RAILWAY

RUNNING PALACE COACHES THROUGH!

— BETWEEN —

CHICAGO & NEW YORK, via BUFFALO

☞ WITHOUT TRANSFER OF PASSENGERS! ☜

All Trains Stop at Twenty-Second Street to Take and Leave Passengers. Baggage Checked at that Station for all Points East.

4 EXPRESS TRAINS DAILY, [Sundays Excepted,] Leave Chicago from the New Depot, on Van Buren St., at the head of La Salle Street, as follow

5:30 A. M. MAIL TRAIN.
VIA OLD ROAD AND AIR LINE. SUNDAYS EXCEPTED.

Leaves 22d Street 7:45 A. M. Stops at all Stations. **Arrives**—Cleveland, 9:35 P. M.

9:00 A. M. SPECIAL NEW YORK EXPRESS,
VIA AIR LINE. SUNDAYS EXCEPTED.

Leaves—Twenty-Second Street, **9:15 A. M.** **Arrives**—Elkhart, 12:45 P. M.; Cleveland 9:45 P. M.; Buffalo, 4:10 A. M.: New York, 7:00 P. M.; (Chicago Time) Boston, 11:45 P. M.

This Train has PALACE SLEEPING COACH Attached, Running

THROUGH TO ROCHESTER, WITHOUT CHANGE!

IN DIRECT CONNECTION WITH

Wagner's Celebrated Drawing-Room Coaches on N. Y. Central R. R.

Only Thirty-Three Hours, Chicago to New York!

5:15 P. M. ATLANTIC EXPRESS (Daily),
VIA OLD ROAD.

Leaves—Twenty-Second Street **5:30 P. M.** **Arrives**—Laporte, 8:10 P. M. (Stops 20 minutes or Supper): arrives at Toledo, 2:50 A. M.; Cleveland, 7:25 A. M. (20 minutes for Breakfast); arrives at Buffalo, 1:50 P. M.; Rochester, 5:10 P. M. (20 minutes for Supper); connects with **Sleeping Coach running Through from Rochester to Boston Without Change,** making but **One Change between Chicago and Boston.**

NEW AND ELEGANT SLEEPING COACH Attached to this Train, Running THROUGH from CHICAGO TO NEW YORK WITHOUT CHANGE! Arrives at NEW YORK, 7:15 A. M.

9:00 P M. NIGHT EXPRESS
VIA AIR LINE. (DAILY EXCEPT SAT. & SUN.)

Leaves—Twenty-Second Street, **9:15 P. M.** **Arrives**—Toledo, 6:15 A. M. (20 minutes for Breakfast); arrives at Cleveland, 10:50 A. M.; Buffalo, 5:50 P. M.; New York, 12:00 M.; Boston, 3:50 P. M.

KALAMAZOO DIVISION.

Leave Chicago 9:00 A. M. Arrive at Kalamazoo 4:10 P. M.; Grand Rapids, 7:10 P. M.

Leave Chicago 9:00 P. M. Arrive at Kalamazoo 7:25 A. M.; Grand Rapids, 10:15 A. M.

☞ There being no heavy grades to overcome, or mountains to cross, the road bed nd track being the smoothest and most perfect of any railway in the United States, this Company run heir trains at a high rate of speed with perfect safety.

☞ Travelers who wish to SAVE TIME and make SURE CONNECTIONS, purchase Tickets via

LAKE SHORE & MICHIGAN SOUTHERN R'Y.

THE ONLY LINE RUNNING THROUGH BETWEEN CHICAGO AND BUFFALO, WITHOUT TRANSFER, and in Direct Connection with NEW YORK CENTRAL RAILROAD and ERIE RAILWAY.

General Ticket Office for Chicago, No. 56 Clark Street.

CHAS. F. HATCH,
General Superintendent, CLEVELAND, OHIO

F. E. MORSE,
General Western Passenger Agent, CHICAGO.

GREAT CENTRAL ROUTE!

SPEED! COMFORT! SAFETY!

MICHIGAN CENTRAL
— AND —
Great Western Railways.

THE FAVORITE ROUTE, VIA NIAGARA FALLS, TO

NEW YORK, BOSTON,

AND ALL EASTERN POINTS.

Pullman's Drawing-Room Cars

FROM CHICAGO TO NEW YORK WITHOUT CHANGE.

CELEBRATED HOTEL CARS FROM CHICAGO TO ROCHESTER.

Passenger Trains leave Chicago from Depot, foot of Lake Street, as follows: (All Trains Stop at Twenty-Second Street Station to receive and leave Passengers.)

5:40 A. M. MAIL TRAIN, Sundays Excepted.
Has a car attached from Chicago going over both Main Line and Air Line Division, Without Change. Connects at New Buffalo for St. Joseph; at Jackson for Lansing, Saginaw and Bay City.

9:00 A. M. NEW YORK EXPRESS.
(SUNDAYS EXCEPTED.) Arrives at Michigan City at 11:10 A. M.; Niles, 12:20 P. M. [Dinner]; Kalamazoo, 2:10 P. M.; Marshall, 3:24 P. M.; Jackson, 4:30 P. M.; Detroit, 6:55 P. M. [Supper]; London, 11:25 A. M.; Hamilton, 2:35 A. M.; Niagara Falls, 4: A. M.; Rochester, 7:10 A. M. [Breakfast]; Albany, 2:00 P. M.; NEW YORK, **7:00 P. M.**; Springfield, 7:40 P. M.; BOSTON, **11:45 P. M.** This Train connects at ROCHESTER with

Wagner's Drawing Room Car through to New York without change!

Connects at Kalamazoo direct for Grand Rapids, Muskegon, Whitehall, &c., &c.

9:30 A. M. CINCINNATI & LOUISVILLE EXPRESS
(SUNDAYS EXCEPTED.) **Through Cars to Indianapolis and Cincinnati without Change.**

4:10 P. M. Kalamazoo, St. Joseph and Three Rivers Accom.
(SUNDAYS EXCEPTED.) Arrives at New Buffalo at 7:05 P. M.; St. Joseph, 8:40 P. M.; Kalamazoo, 10:05 P. M.; Three Rivers, 10:00 P. M.

5:15 P. M. ATLANTIC EXPRESS.
Leaves Daily. ☞ Arrives at Michigan City at 7:18 P. M.; Niles, 8:30 P. M. [Supper]; Kalamazoo, 10:40 P. M.; Jackson, 1:10 A. M.; Detroit, 3:45 A. M.; London, 8:35 A. M. [Breakfast]; Hamilton, 11:40 A. M.; Niagara Falls, 1:30 P. M.; Buffalo, 3:20 P. M.; Rochester, 5:10 P. M.; Albany, 1:30 A. M.; NEW YORK, **6:40 A. M.**; Springfield, 6:40 A. M.; BOSTON **11:00 A. M.** A MAGNIFICENT

PULLMAN DRAWING-ROOM SLEEPING CAR

IS ATTACHED TO THIS TRAIN DAILY, FROM

CHICAGO TO NEW YORK CITY.

☞ The Celebrated **HOTEL CAR** is also Attached to this Train from **CHICAGO** to **ROCHESTER.**

☞ **SPECIAL NOTICE.**—Boston and New England Passengers will please notice that thi Train now makes a direct connection through. A **Sleeping Car** is attached at Rochester at 5:30 P. M., running through to Springfield, Mass., thus avoiding transfer at Albany. Breakfast at Springfield. This Train reaches Springfield early enough second morning to CONNECT WITH ALL TRAINS up and down the Connecticut

6:30 P. M. CINCINNATI & LOUISVILLE EXPRESS
(SATURDAYS EXCEPTED.) **Through Sleeping Cars to Louisville without Change.**

This is the Only Line Running Sleeping Cars to Louisville!

9:00 P. M. NIGHT EXPRESS. Saturdays and Sundays Excepted
☞ Arrives at Michigan City at 11:03 P. M.; Niles, 12:25 A. M.; Kalamazoo, 2:00; Marshall, 3:12; Jackson, 4:25; Grand Trunk Junction, 7:00; Detroit, 7:45; London, 1:45 P. M.; Hamilton, 4:35; Toronto, 9:35; Niagara Falls, 5:40; Buffalo, 7:15 P. M.; Rochester, 9:10; Syracuse, 12:25 A. M.; Rome, 1:55; Utica, 2:25; Albany, 6:30 A. M.; NEW YORK, **12:00 M.**; BOSTON, **3:30 P. M.**

A PULLMAN PALACE SLEEPING CAR

Is attached to this Train for **DETROIT.** This Train connects at **DETROIT JUNCTION** with **Grand Trunk Railway** for

MONTREAL, OGDENSBURG, &c.

9:00 P. M. Grand Rapids Express.
(SATURDAYS AND SUNDAYS EXCEPTED.) Arrives at Grand Rapids at 9:50 A. M.

An Elegant Pullman Sleeping Car

IS ATTACHED TO THIS TRAIN

THROUGH TO GRAND RAPIDS WITHOUT CHANGE!

Connecting there Direct to MUSKEGON, WHITEHALL, &c., &c.,

SPECIAL NOTICE.—The GREAT WESTERN RAILWAY of Canada have during the past summer, put down 140 miles of New Rail, (a large proportion of the same being Steel Rails,) and otherwise improved their track, so that it can be truly said that it is in as good condition as any Line in the country.

☞ **Through Tickets** (and secured accommodations in Drawing-Room Sleeping Cars) can be purchased in Chicago at **60** Clark street (under Sherman House); at **48** Clark street (Grand Trunk Railway); at **53** Clark street (N. Y. C. R. R.); at office under Briggs House; at Great Central Depot, and at

General Office in Tremont House Block.

H. E. SARGENT,
Gen. Sup't M. C. R. R.

W. K. MUIR,
Gen. Sup't Gt. W. R'y.

HENRY C. WENTWORTH,
Gen. West. Pass. Agt. M. C. & Gt. W. Ry

NOTICES OF THE PRESS.

"Of great interest to railroad men."—[Delaware (O.) Gazette.

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"A model of what a railroad newspaper should be."—[Chicago Tribune.

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"A well-edited paper, showing industry and intelligence."—[American Railway Times.

"The best informed railway newspaper published in the West."—[Aurora (Ill.) Beacon.

"Unquestionably the best railroad journal in the United States.—[Waukegan (Ill.) Patriot.

"Standing in the front ranks of railroad journals."—[Snow's Pathfinder Railway Guide.

"Makes a very handsome appearance and is full of valuable matter."—[Chicago Evening Post.

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